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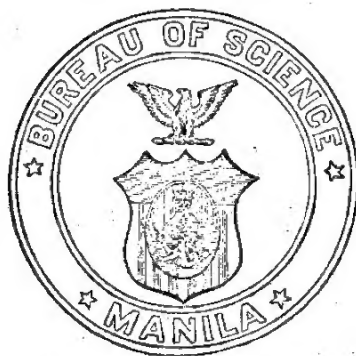
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AN EXPERIMENT WITH ORANGE-RED UNDERWEAR.¹

By JAMES M. PHALEN.²

In his annual report for the fiscal year ending June 30, 1907, Lieutenant-Colonel William T. Wood, inspector-general of the Philippines Division, called attention to the experience of British army officers in India in the use of colored linings for their headgear, as well as to other experiments along the same line, and reviewed the recent literature bearing upon the subject. He recommended that an extended experiment be instituted in these Islands and that sufficient underclothing and hat linings of an orange-red color to equip several regiments be sent over here. This recommendation, upon being referred to the Surgeon-General and the Quartermaster-General, was concurred in and the latter recommended that 5,000 suits of orange-red underclothing and a like number of hat linings be authorized for the purpose. This was approved by the War Department, the clothing was prepared at the Philadelphia depot and shipped here, arriving in November, 1908. White underclothing of similar material was sent at the same time in sufficient quantity to equip an equal number of men, to be used as controls for the experiment. Upon the recommendation of the chief surgeon of the division, the details of the experiment were intrusted to the Board for the Study of Tropical Diseases, the members of which at this time were Captains James M. Phalen and H. J. Nichols, Medical Corps.

¹ Read at the first biennial meeting of the Far Eastern Association of Tropical Medicine, held at Baguio, P. I., March 14, 1910.

² Captain, Medical Corps, United States Army, member of the United States Army Board for the Study of Tropical Diseases as they exist in the Philippine Islands.

THE SCOPE OF THE TEST.

In an indorsement from the office of the Surgeon-General, a number of suggestions for the carrying out of the experiment were made, the most important being as follows:

In order that other conditions may be the same, the orange-red clothing should be issued to half companies occupying the same barracks; the special clothing should be worn at all times for at least a year, and the controls should have exactly the same clothing, except for color.

If practicable, the same medical officers should remain on duty with the troops under observation for the entire period and should keep a careful record of the comparative amounts and nature of sickness among them; also of the subjective sensations of the soldiers as to comfort or discomfort in the sun, their mental and bodily vigor, etc.

A number of officers and enlisted men who are specially susceptible to the effects of the sun should be equipped with the orange-red garments and required to report the results.

With these suggestions as a basis, the Board, in coöperation with Colonel J. van R. Hoff, the chief surgeon, drew up a plan for the experiment which was approved by the division commander. The main details for the test were as follows:

(a) The equipment of approximately 1,000 men with the colored under-clothing and hat linings, with 1,000 men as controls to be furnished with white underclothing of similar texture. The men to be taken from different branches of the service and at widely separated posts so that all sections of the Islands should be covered. For this purpose the following troops, on account of the above reasons and because they had the necessary year to serve in the division, were selected:

Fifth Field Artillery, Fort McKinley, Luzon.

First Cavalry, Camp Stotsenburg, Luzon.

Fourth Infantry, Camp Jossman, Iloilo.

Twenty-third Infantry, Zamboanga, Mindanao.

(b) That the men who wear the special clothing and the controls should be taken from the same companies, which were to be equally divided in such a manner as to make the two groups as nearly similar as possible in physique; all men of long tropical service and those of exceptionally weak constitution to be excluded from the companies before dividing.

(c) That all officers, and especially those particularly susceptible to the effects of the tropical sun, should be invited to equip themselves with the special under-clothing and report upon it at the end of the period of experiment.

(d) That a medical officer be detailed at each of the posts mentioned above, whose duty it would be to supervise the details of the test at his post. That these medical officers should not be separated from the troops equipped with the special clothing nor given duties that would interfere with the performance of this work. The medical officers selected for the duty were as follows: Fort William McKinley, Major C. C. Collins; Camp Stotsenburg, First Lieutenant G. L. McKinley; Camp Jossman, Captain L. M. Hathaway;² Zamboanga, First Lieutenant C. D. Cowles, jr.

² Almost at the beginning Captain Hathaway asked to be relieved from this duty and First Lieutenant Hiram A. Phillips was detailed in his stead.

(e) That records be kept of the medical history of the men during the test, including the number of days lost by sickness and the nature of the illness.

(f) That the weight, strength test, and blood pressure be recorded at quarterly intervals for all the men.

(g) Blood examinations, including red and white counts, differential counts, and hemoglobin estimations, to be made upon a limited number of men three times during the year.

(h) Observations to be made and recorded upon the pulse, temperature and respiration after exercise at frequent intervals.

(i) Special observation to be made as frequently as possible upon both sets of men after exercise, with a view to noting any symptom referable to climatic effects.

(j) A statement to be obtained from each wearer of the special underwear as to the individual advantages or disadvantages of the garments.

(k) The experiment to occupy the calendar year 1909.

THE GARMENTS.

The underwear and the hat linings designated for the experiment arrived in Manila about the first of December, 1908, and were distributed to the posts shortly thereafter. Difficulties began to be encountered upon the arrival of the requisitions. An undue proportion of small sizes of the garments was found to be present, this being particularly true of the orange-red undershirts. Only about 1,100 of the 5,000 sent were of sizes 36 and 38, which are worn by a majority of men. Therefore, rather more of a selection of men was necessary than at first was contemplated or thought desirable, a larger proportion of smaller men being required for the experiment.

The estimate of the War Department officials for five suits of underwear per man for the year, brought forth protests from a number of post and organization commanders, the calculations of the latter running from about eight to fifteen suits per man. As the purpose of the experiment would be defeated if an insufficient supply of the garments were furnished, it was decided that the needs of the wearers must be met. For the above reasons, the number of men actually equipped and kept under observation fell short of the original estimates. About 500 men in all were equipped with special underwear, including 20 men of the Hospital Corps at the Division Hospital, Manila, and 40 general prisoners at the Fort William McKinley prison. An equal number of controls with white underwear were used.

The undershirts issued were those that have been provided for some years past under the name of "*undershirts, cotton*," a garment with a round neck, without buttons, and weighing approximately 8.5 ounces. The drawers were different from anything that recently has been issued, being a rather superior garment of heavy jean with webbing inserts at the seams. The weight of this garment was 8.9 ounces.

The colored garments when received were of a deep, orange-red color, the red predominating. The dyeing of the garments was very nearly

uniform throughout the lot. Garments were washed and dried under varying conditions to test the stability of the dye. The first washing gave a distinctly red color to the water; however, this apparently was due to an excess of the dye, as the garments were not materially changed in color. Subsequent washings gave very little coloration to the water. The jean drawers lost their color faster than the softer undershirt. When the clothing was dried in the shade very little fading took place, but when exposed while wet to the sunlight the loss of color was very rapid. Here, too, the jean drawers lost color more rapidly than the undershirts. At the beginning of the experiment, garments were submitted to a local dyer for test, and he reported that they met the requirements of the soap and soda tests as recognized by the trade. The hat linings were not of a fast color; the first washing removed the greater part of the dye. As the washing of these articles was not contemplated, this was no great objection, except that rain and perspiration caused the color to run.

In actual use this clothing lost some color in a very short time. After a few months the garments presented all shades, from that approximating the original to a dirty cream-color. The same garment usually gave a variety of tints in proportion to the relative exposure to the sun. The red coloring matter was less resistant than the yellow, the first change being a rapid one from orange-red to yellow and then gradually to cream-color. The garments retained their color much better upon the inner than on the outer surface, showing the influence of direct sunlight upon the dye, and the much greater importance of this factor than that of the washing.

As the weight of these garments has been a matter of criticism, it will be of interest to note that by weighing a large number of the undershirts, both colored and white, it was found that there was an average increase of but one-fifth of an ounce due to the dyeing. As the colored drawers and those issued to the control were of different types, a like comparison was not possible, but the colored drawers averaged 1.2 ounces heavier than the white.

SUMMARY OF OBSERVATIONS.

The experiment, in accordance with instructions, was continued throughout the year 1909, the records being kept upon a blank furnished by the Board for Study of Tropical Diseases. By the end of the year the records, including those from outside sources, were completed. The several items contained upon the cards will be taken up serially and any discrepancies between the two groups pointed out as they come up, but the discussion of their significance will be withheld until the summary.

Weight.—The tables here given show comparative weights at three

periods of the experiment—in January, in July, and at the end of the year, in December. The first table gives the weights of one hundred men of each group, selected because they arrived in the Philippines very shortly before the beginning of the experiment; therefore this table gives an indication of the change in weight of newcomers. In the second table are given the weights of all the men under observation.

TABLE I.—*Comparative weights of recent arrivals in pounds avoirdupois.*

Group.	Begin- ning.	Mid- year.	Loss.	End.	Loss.
Orange-red	139.3	135.0	4.3	135.2	3.1
White	140.9	137.7	3.2	137.6	3.3

Of the first group, 86 men lost weight, 11 gained, and 3 remained stationary. Of the second group, 19 men lost weight, 14 gained, and 7 remained the same.

TABLE II.—*Comparative weights of all men observed, in pounds avoirdupois.*

Group.	Begin- ning.	Mid- year.	Loss.	End.	Loss.
Orange-red	141.6	137.6	4.0	138.8	2.8
White	143.0	139.9	3.1	140.6	2.4

The difference between these two tables is very little, showing mainly a slightly greater average loss in weight for the new arrivals. The differences are greater in reality than appear in the tables. Whereas, the new arrivals almost uniformly lost weight in very nearly equal proportion, the older residents showed much greater variations, the losses and gains being more decided in character and more irregular. As a group, the inmates at the military prison at Fort McKinley gained an average of 1.3 pounds per man, although they fell off 0.8 pound in the middle of the year. A common feature of both tables and of both groups is the loss of weight, greater at the middle of the year than at its close. The obvious explanation of this phenomenon is the higher average temperature during this time of the year and the consequent greater loss from perspiration. Comparing the two groups, it is of interest to note that the loss of weight of those wearing the special clothing was materially greater at the mid-year period than that of the group wearing white. This difference does not appear at the close of the year.

Blood counts.—The blood of 123 men was examined at the beginning of the year, but because some of the men left the division, the last of the three examinations included but 115 men. The red and white

corpuscle counts were made with a Thoma-Zeiss haemocytometer and the hæmoglobin estimates with the Dare instrument. In the differential count no attempt was made to divide the lymphocytes into groups and the differentiation between this class and the large mononuclears was made upon their staining reactions rather than upon their sizes.

TABLE III.—*Blood examinations.*

Period and group.	Erythrocytes.	Hæmoglobin.		Leucocytes.	Polymorpho-nuclears.	Lymphocytes.	Large mono-nuclears.	Eosinophiles.	Mast cells.
		P. ct.	P. ct.		P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
At beginning:									
Orange-red (66 men).....	5,085,100	93.5	91.9	7,122	55.2	35.6	5.3	3.2	0.7
White (57 men).....	5,075,000	89.6	88.3	7,475	57.8	33.3	5.3	2.7	0.9
At mid-year:									
Orange-red (62 men).....	5,156,000	91.6	88.8	7,552	58.3	32.2	6.1	2.8	0.6
White (56 men).....	5,090,000	88.4	86.7	7,305	59.4	32.9	1.0	3.4	0.3
At end:									
Orange-red (61 men).....	5,346,000	92.4	86.4	6,868	55.4	36.8	5.0	2.5	0.8
White (54 men).....	5,184,000	89.2	86.0	7,372	58.7	32.6	4.6	3.6	0.5

The results of these examinations agree in character if not in degree with those made by Captain W. A. Wickline, Medical Corps, whose excellent work along this line at Camp McGrath in 1905-1906 appeared in one of the late volumes of the Military Surgeon. In both groups, as in Captain Wickline's subjects, there was an increase in the number of the red cells and a decrease in the percentage of hæmoglobin, the hæmoglobin index showing necessarily an even greater diminution. The differential leucocyte count shows the same high proportion of lymphocyte cells, this increase being at the expense of the polymorphonuclear cells. This variation from the normal proportions appears in the first count and is quite uniform throughout the three examinations. The disparity between these counts and those of Captain Wickline, whose earlier examination showed a fairly normal proportion in the white cells, is due to the fact that Captain Wickline's subjects were largely new arrivals from the United States, while the examinations here reported were mainly on men who had served for a year or more in the Philippines.

The chief difference noted in the two groups is the greater increase in the red cells with a greater decline of the hæmoglobin index in the group wearing the special underclothing. One explanation of the erythrocyte increase in the Tropics is that it is due to excessive perspiration, which, by concentrating the blood, gives an increase which is not

actual but only relative to the fluid elements. The other theory is that the increase is an actual one, the number of red cells being augmented by the stimuli of heat and light upon the blood regenerating organs. Whatever weight of evidence may be attached to our examinations, the results are strongly in favor of the first explanation. As will be shown later, the heat is greater under the orange-red underwear and perspiration more profuse, while the actinic rays of the sun, which are credited with causing the increased stimulation according to the second theory, are retarded by the color.

Blood pressure.—The instrument used in these investigations was the Riva-Rocci, as modified by Doctor Cook of New York, this instrument having a 4-inch arm piece. Only the systolic pressure could be measured with this apparatus, but as comparative results alone were needed, this was not a serious objection.

The following table gives the average readings of the two groups at quarterly intervals. About 2,000 observations were made upon 480 men wearing the special underwear and about 1,500 observations upon 420 men wearing the white. The readings are in millimeters of a mercurial column.

TABLE IV.

Group.	January.	April.	August.	December.
	mm.	mm.	mm.	mm.
Orange-red.....	124.8	121.1	117.9	125.5
White.....	123.3	120.6	118.1	122.9

It will be seen that there was a noticeable falling off in blood pressure in April, 3.7 millimeters for the special groups and 2.7 for the controls. This is explainable by the great increase in atmospheric temperature from January to April and the consequent loss of body fluids by perspiration. In August there is a still greater drop in pressures, the loss from the first of the year being 6.9 millimeters for the special group and 5.2 millimeters for the white group. The heat of April, although modified by rains, has moderated but little, while the long continued heat, together with increased humidity has had its enervating effects. However, by December, the climatic conditions of January are closely approximated and it is seen that the average blood pressures have increased to very nearly or quite their original point. At the end of the year the average of the special group was 0.7 millimeter over that of January, while for the white group there was a loss of 0.4 millimeter. A comparison of the two groups shows that during the hot periods the loss for those wearing the orange-

red was slightly greater than for those wearing white, a logical effect of the increased perspiration for the first group.

Temperature, pulse and respiration.—These observations were taken as soon as possible after the subjects had completed a tour of drill or fatigue duty or other exercise causing exposure to the sun's rays. A total of about 4,000 observations were taken upon each set of men. The following table gives the average of 1,500 observations upon each group. Only the figures are given at this time, any abnormalities of the rhythm or quality of the pulse or respiration being noted under another heading.

TABLE V.

Group.	Temperature.	Pulse.	Respiration.
	°F.		
Orange-red.	98.792	91.2	22.2
White.	98.780	90.9	21.3

The variation from the normal temperature is very slight in either group, and the difference between the two is so slight as to be wholly negligible. In both, the pulse and respiration rates are higher than the normal, and in both instances the special group of men show higher rates than the controls, although these differences are not very marked.

Strength tests.—At the outset of the experiment a requisition was made for hand dynamometers of a certain make, the object being to keep a record of the strength of the subjects of the test. The instrument asked for was one that not only marked the force of the grip but also the time for which it could be sustained. The apparatus sent did not meet the requirements, as it registered only the strength of the initial grip. A large number of observations were made with this instrument but they were found to be of no value whatever without the element of time. It was observed that a man greatly fatigued, whose strength as recorded by the more elaborate ergometer was depressed 50 per cent from the normal, could still muster strength for the moment practically to equal his normal grip. For these reasons no tabulation of the strength is given. The Brem's ergometer was used only for special experiments, it being too large and heavy to be of general use in the test.

Comparative sick reports.—The table which follows gives a comparison of the number of cases of illness of the different classes together with the number of days lost from each cause, and for better comparison the cases and days reduced to rates per thousand men. All cases of injury or other accidental disease, venereal diseases and other causes of admission upon which climate could have no effect have been excluded from this comparison.

TABLE VI.

Cause.	Orange-red group (450 men).				White group (420 men).			
	Admissions.		Days lost.		Admissions.		Days lost.	
	Number.	Rates per 1,000.	Number.	Rates per 1,000.	Number.	Rates per 1,000.	Number.	Rates per 1,000.
Heat exhaustion.....	12	27	53	117	9	21	27	64
Malaria.....	69	153	433	962	64	152	493	1,174
Febricula.....	17	37	95	211	20	48	109	259
Dengue.....	25	55	195	433	17	40	155	369
Climatic lingo.....	6	13	183	406	5	12	140	333
Rheumatism, muscular.....	8	17	102	226	7	16	35	83
Gastro-intestinal.....	45	100	259	557	36	85	238	566
Respiratory.....	16	37	115	255	19	45	126	300
Nervous.....	3	7	14	31	6	14	31	74
Skin.....	28	62	148	328	19	45	126	300
Total.....	229	508	1,597	3,526	202	478	1,480	3,522

While there are considerable variations for certain causes of admission, these about balance each other, and the rates per 1,000 for admissions and days lost very closely approximate each other. The slightly higher rate for heat exhaustion in the special group is worthy of note, although there is little else in this table that is significant.

Symptoms referable to climate.—There are a number of symptoms which are well recognized as being due to the effects of heat and sunshine, and these as observed after the men have been at drill or fatigue duty or upon practice marches, are given in the next table. It is practically impossible to reduce these two groups to a common basis, but the numbers of observations upon them approximately are equal.

TABLE VII.—Symptoms due to the effects of heat and sunshine.

Manifestations.	Orange-red group.	White group.	Manifestations.	Orange-red group.	White group.
Headache.....	179	146	Fatigue.....	7	5
Dizziness.....	53	64	Muscular weakness.....	7	15
Feverish sensation.....	31	28	Muscular pain.....	6	7
Excessive thirst.....	7	9	Pain in eyes.....	5	1
Dryness of lips, mouth and throat.....	9	13	Precordial pain.....	2	3
Blurred vision.....	33	23	Sore throat.....	7	6
Nausea.....	21	26	Coryza.....	8	20
Vomiting.....	3	3	Chilly sensations.....	5	4
Pulse, irregular.....	7	4	Nervousness.....	2	3
Pulse, intermittent.....	10	12	Dyspnea.....	0	3
Pulse, weak.....	39	32	Tachycardia.....	2	2
Excessive perspiration.....	21	2	Tinnitus aurium.....	1	0
			Fell out on drill or march.....	10	10

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Nervous.....	3	7	14	31	6	14	31	74
Skin.....	28	62	114	328	19	45	126	300
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Pulse, intermittent.....	10	12	Dyspnea.....	0	3
Pulse, weak.....	39	32	Tachycardia.....	2	2
Excessive perspiration.....	21	2	Timitus aurium.....	1	0
			Fell out on drill or march.....	10	10

This table shows that the two groups of men suffered in very nearly equal proportions from the effects of the heat, the greatest variations being in the item of excessive perspiration, in which the special group gave a much greater proportion than the controls. As this phenomenon was the evidence of the medical officers and not the statement of the subjects observed, it is a significant fact. The other symptoms vary to an extent that could be accounted for by the laws of chance, and therefore are of no special signification.

Impressions of the wearer.—At the close of the experiment each man who wore the orange-red underwear was asked to give his opinion of it, and to express his views as to its advantage or disadvantages.

The tendency of the man was to give the consensus of opinion of the organization as his own, but this was overcome as far as possible by a list of questions previously prepared. Of the whole number only 16 men preferred the colored underwear to white; that it was cooler, was the reason assigned by 7 men, while 4 declared that it relieved them of headache and dizziness; relief from headache, fever, and prickly heat each were assigned by one man as a reason for preferring the colored garments, while the remaining 2 men paid the clothing the doubtful compliment that it did not show the dirt like the white; 54 men stated that they experienced no effect one way or another from the clothing and that they had no choice between the colors. A decision adverse to the colored underwear was pronounced by all the rest of its wearers, nearly 400 in all. In 50 instances it was declared to be hotter than the white, while 104 men expressed the same idea by saying that it caused more profuse perspiration. It was perhaps the same impression that caused 21 men to declare it too heavy; 64 said that it felt more "uncomfortable" than the white, many attributing this to the irritating effect on the skin. Other complaints relative to the skin were that it "scratched," given by 5 men; that it "caused itch," given by 3; that it "caused skin disease," given by 2; while 6 complained of its causing prickly heat. Two of the latter said they had never suffered from this complaint until wearing this underwear and that it had since been persistent. The appearance of the underwear was apparently distasteful to a number of men, especially after the garments had faded. Fifty-two men objected to the clothing because of its fading, while 42 disliked its appearance after washing, declaring it "dirty looking," "lacking in neatness," and "unsanitary." The staining of the outer clothing from the dye was mentioned by 2 men. Four spoke of a bad odor from the clothing and this was mentioned by one of the organization commanders. Among the effects charged to the clothing, by lesser numbers, were headache, dizziness, fever, blurred vision, boils, colic, and a tendency to catch colds.

It is not to be doubted that there was some prejudice against the clothing in the minds of the wearers. This was due to the fact that they were rendered conspicuous and were subjected to bantering by their companions. The fact that they were charged with experimental clothing also had a bad effect. Despite this handicap it is thought that the criticisms of the clothing by the men were made in all sincerity, and expressed their true impressions of the test.

All the organization commanders who reported upon the clothing, expressed the opinion that no effect was apparent from its use. The lack of stability of the dye was commented upon by all and the general

opinion was that the colored clothing was heavier and caused more perspiration than the white.

The special underwear was given a trial by sixteen officers. In a majority of cases it was discarded after a short time because its weight was greater than that usually worn and it was therefore much hotter. This objection induced the members of this Board to have the nainsook underwear, as sold by the quartermaster department, dyed by a local dyer to the same color as the special clothing. This was an improvement, but the writer could see no advantage in the colored clothing over the white of a similar weight. Only one unqualified expression of approval came from these officers, and this was from one who stated that he always had experienced a feeling of depression of spirits and irritation after exposure to the sun previous to wearing the colored underwear, but that this had been relieved entirely by its use. He was convinced that it was the proper clothing for use in the sun, but added that it kept him slightly warmer than did the white.

EXPERIMENTAL EVIDENCE.

It can be accepted without question that a fabric of red or orange-red color is highly protective against those chemical rays of the sun which reduce the photographic plate. Other colors have varying degrees of protective influence, but all are protective to some extent. However, the protection afforded by a fabric depends not only on its color, but upon its thickness and the tightness of its weave. A great deal of information has been obtained by exposing to sunlight photographic plates covered by fabrics from the different articles of the uniform. By adding to these fabrics layers of the colored and white underwear and the orange-red hat linings, a good idea was obtained as to the increased protection from the actinic rays of the sun afforded by the colored garments. The most interesting result is that the campaign hat, two varieties of which were used, is as opaque to chemical rays without a red lining as with it. The lining materially added to the opacity of the khaki cap, and showed a slight improvement over the ordinary lining of a green or brown color as seen in the caps bought of the military supply houses.

A comparison of the English and American khaki shows that the added weight and tighter weave of the latter increased the degree of protection afforded against the rays which reduce the photographic plate when the exposure was as short as could be made with the slide shutter. A longer exposure of the English khaki with the colored and white undershirt shows what a material difference in opacity the orange-red color produces. The same kind of experiments were made, using material from the blue flannel shirt, the olive-drab shirt, and the blue chambray shirt in the same manner. Not much would be expected from the cham-

bray shirt, but the blue and olive-drab flannel shirts were shown to be not nearly so protective chemically as would be expected.

It is a widely, but not universally accepted theory that the pigment in the skin of the dark-hued races is an effect of the chemical rays of the sun, and that its purpose is to protect the organism from the deleterious influence of these rays. Certain it is that sunlight increases the deposition of pigment in the skin as it shown by tanning in the white race. That the dark pigment of the Malay or the Negro is due to a like cause is not so apparent and that it was deposited for the purpose of protection from the sun is rather difficult of proof. If a determination of the chemical nature of the skin pigments of the different colored races has ever been made I am unaware of it. Sambon, of London, photographed the spectrum of an electric arc lamp after passing the rays through the skin of a native of India and then constructed a cloth that would have the same effect. This cloth was of a dark color externally, and red inside.

To determine the relative opacity of the skin of different degrees of pigmentation, specimens were obtained from an exceptionally white subject, from a light Filipino, and from one of the darkest subjects obtainable. These specimens were subjected to the same photographic tests as the fabrics mentioned above. The skin specimens were first prepared by removing all subcutaneous tissue and making them as nearly as possible of uniform thickness. By reference to a series of photographs, comparing the very dark skin with the white, it could be seen that the former, as expected, was more resistant to light than the latter. The difference was most noticeable for the shorter exposures, being much less so as the time of exposure is increased. It could be seen that the white skin was quite opaque to the chemical rays, and that when the time of exposure was increased to one minute the effects on the photographic plates did not differ very greatly. The effect upon the plate produced by a one-minute exposure through the dark skin was approximated in about one-fourth that time through the white. A comparison of the effect produced through the light brown and the white skins gave almost no difference in their degrees of opacity during a fifteen-second exposure, and those of less duration produced no greater variation. The added effect of the texture of the skin was shown. Both the white and the dark brown were firm and tough, while the light brown was of a much softer texture. It is apparent that the superior density of the white skin has compensated for the increased pigment of the light Malay. Another photograph was made giving a fifteen-second exposure through the darkest skin and through the white skin reinforced by one layer of khaki uniform cloth. It was observed that the khaki material completely neutralized the difference in opacity which exists between the two.

A comparison of these photographs with those made through the fabrics showed another important fact. It will readily be seen that the

pigment of the darkest skin does not by any means approximate the orange-red of the experimental garments in the matter of excluding the chemical rays, and this is the more remarkable when the thickness and close texture of the skin is contrasted with the lesser thickness and loose weave of the undershirt used. This observation is in support of the statement of Doctor Freer, of the Philippine Bureau of Science, that the obstruction offered to the chemical ray by red or similar color is not due to any inherent quality of the color as such, but varies with the chemical nature of the dyes used.

One of the earliest and most persistent complaints against the orange-red underwear was that it was hotter and caused more perspiration than the white. If this could be proved and the difference in temperature found to be at all great, the fact would be a serious objection to its further use. In order to determine how much foundation there was for these complaints the following experiments were carried out:

Experiment No. I.—Two thermometers were first tested by heat and cold to see that they registered equally.

Experiment No. II.—The thermometers were placed, one behind a screen of orange-red and the other behind a screen of white, both screens being made of the undershirt material. After an exposure of the screens to twenty minutes of direct sunlight, with free circulation of air around the thermometers, both registered 36° C.

Experiment No. III.—The thermometers were inclosed in equal thickness of the two materials. After twenty minutes the one inclosed in orange-red registered 52° C., while that inclosed in white registered 44.6° C. The thermometer inclosed in white attained its maximum more quickly than that in the red.

Experiments Nos. IV and V.—Thermometers were placed in empty flasks and covered with orange-red and white undershirt material, and in flasks of ice water covered in the same manner and exposed to sunlight. The table below shows the variations in the temperatures, in degrees centigrade.

TABLE VIII.

Exposure.	Air temperature.		Water temperature.	
	White.	Orange-red.	White.	Orange-red.
	°C.	°C.	°C.	°C.
Beginning			8.0	8.0
After 10 minutes	39.0	41.0	11.0	10.5
After 20 minutes	41.2	43.5	13.8	14.2
After 30 minutes	43.0	46.0	16.2	17.5
After 40 minutes	43.2	47.0	19.0	20.5
After 50 minutes	43.5	48.0	21.5	23.4
After 1 hour	44.0	48.2	23.2	25.2
After 1½ hours			27.0	29.6

The irregular changes in the temperature are accounted for by the presence of fleecy clouds which at times mitigated the effect of the sunlight.

Experiment No. VI.—The last experiment was repeated, except that hot water was used and the flasks allowed to remain in the shade.

TABLE IX.

Exposure.	Water temperature.	
	White.	Orange-red.
	°C.	°C.
Beginning.....	75.0	75.0
After 10 minutes.....	71.0	72.0
After 20 minutes.....	68.5	70.0
After 30 minutes.....	65.2	67.0
After 40 minutes.....	63.0	65.0
After 50 minutes.....	59.0	61.0
After 1 hour.....	57.5	59.5

Experiment No. VII.—A composite shirt was made by sewing together one-half of an orange-red garment and one-half of a white one. This was put on a man and clinical thermometers, protected with corks to keep them away from the surface of the body and the cloth, were suspended, one under each side. After ten minutes' exposure to the sun the thermometer beneath the white side registered $37^{\circ}.75$, while that beneath the orange-red registered 43° .

The thermometers were then permitted to lie against the body, with the shirt in contact with the instrument. Ten minutes' exposure resulted in a record of 36° under the white and $37^{\circ}.25$ under the orange-red. During the experiment the subject perspired profusely. He reported the perspiration first on that side covered by the orange-red, and the moisture appeared through the cloth very much earlier on this side than on the white.

The experiments with the air and cold water temperatures were repeated except that in each case the materials used were covered with a layer of khaki cloth. The same results were obtained, differing only in degree, there being not so much difference between the temperatures as when nothing intervened between the sun's rays and the undershirt material.

UPON THE PHYSIOLOGICAL EFFECTS OF MOIST HEAT.

Through the kindness of Captain P. L. Boyer, Medical Corps, we were enabled to make use of the bathrooms at the hospital at Los Baños for a series of experiments, the purpose of which was to show what effects would be produced upon the human organism by exposure to a high degree of heat and moisture. The subjects were volunteers from the detachment of the Hospital Corps, stationed at the hospital. For the purpose of the experiment one of the bathrooms was placed at our disposal. This consisted of a room about 15 feet long by 8 feet wide into which, at one end, opened a small steam room, this latter being situated immediately above one of the hot springs. The temperature could be raised by allowing hot water to run in the bathtub in the large room, or by opening the door of the steam room to the necessary degree, and by the same means the moisture in the atmosphere could quickly be raised to the saturation point. The room was provided with a small window at one side and a door at the end, both fitted with slats, allowing quite a free draft across a section of the room and keeping the whole place well ventilated.

Four subjects, in good physical condition, were selected and these were subjected, two at a time, to four hours in a temperature of from 92° to 98° F. as recorded by a wet-bulb thermometer. The atmosphere was kept saturated with moisture as evidenced by the dripping of water from the walls and by records of wet and dry bulb thermometers. The subjects, clothed in suits of thin majssock underwear and socks, entered the bathroom where settees of rattan, upon which they could recline, were provided. The experiments in each case were begun in the early afternoon, soon after the noon meal.

SUBJECT NO. I.—J. P., age 24 and weighing 146.5 pounds.

Exposure.	Room temperature.	Pulse.	Respiration.	Temperature.	Blood pressure.
	°F.			°F.	mm.
Beginning.....	92	80	18	98.8	135
After 30 minutes.....	92	80	18	99.2	---
After 1 hour.....	93	78	22	99.8	---
After 1½ hours.....	94	80	22	100.0	---
After 2 hours.....	94	84	22	100.0	---
After 2½ hours.....	95	84	21	100.2	---
After 3 hours.....	95	92	21	100.1	---
After 3½ hours.....	95	94	24	101.0	---
After 4 hours.....	94	90	22	100.2	118

The subject lost 2.5 pounds in weight, and his strength as recorded by the Brem ergometer fell off 48 per cent during the experiment. However, he was able to record as strong a grip with a hand dynamometer after as before the experiment.

SUBJECT No. II.—*W. R., age 19 years and weighing 139 pounds, a short muscular subject.*

Exposure.	Room temperature.	Pulse.	Respiration.	Temperature.	Blood pressure.
	°F.			°F.	mm.
Beginning.....	92	72	18	98.6	128
After 30 minutes.....	92	80	20	99.6	
1 hour.....	93	84	23	100.0	
1½ hours.....	91	91	22	100.2	
2 hours.....	94	88	22	100.2	
2½ hours.....	95	90	23	100.4	
3 hours.....	95	94	24	100.4	
3½ hours.....	95	94	21	100.4	
4 hours.....	94	90	22	100.2	102

The loss of weight in this subject was 3 pounds, and the ergometer showed a decrease of 58 per cent in strength.

SUBJECT No. III.—*F. F., age 25 years and weighing 136 pounds.*

Exposure.	Room temperature.	Pulse.	Respiration.	Temperature.	Blood pressure.
	°F.			°F.	mm.
Beginning.....	95	76	14	98.1	124
After 30 minutes.....	95	96	16	99.5	
After 1 hour.....	96	96	18	99.6	
After 1½ hours.....	96	92	18	99.8	
After 2 hours.....	97	92	16	100.0	
After 2½ hours.....	98	96	18	100.4	
After 3 hours.....	98	96	20	100.4	
After 3½ hours.....	98	104	22	100.6	
After 4 hours.....	98	112	22	101.2	116

The loss in weight in this case was 4 pounds and the loss of strength, as shown by the ergometer, was 26 per cent.

SUBJECT No. IV.—*O. H., age 2½ years and weighing 144 pounds.*

Exposure.	Room temperature.	Pulse.	Respiration.	Temperature.	Blood pressure.
	°F.			°F.	mm.
Beginning.....	95	74	18	98.6	135
After 30 minutes.....	95	80	20	99.0	
After 1 hour.....	96	92	28	100.0	
After 1½ hours.....	96	88	28	100.0	
After 2 hours.....	97	88	26	100.2	
After 2½ hours.....	98	88	25	100.4	
After 3 hours.....	98	96	28	100.4	
After 3½ hours.....	98	96	28	101.0	
After 4 hours.....	98	96	28	101.4	120

This man lost 3.5 pounds in weight and 21 per cent in strength.

The writer remained with these men during the entire time of the experiment and made the observations. The men were told that if they cared to do so they could take a nap or smoke, or occupy themselves as they pleased. They all settled themselves for a restful afternoon, but in a very little time they became wakeful and restless. After sitting on the settees for a short time they began to walk around the room. They smoked and carried on fragmentary conversation, but the restlessness remained during the afternoon. Sweating was very profuse and the clothing soon was saturated. A noticeable change took place in the character of the respiration: inspiration became slow and deep and quick expiration and then an interval before the next inspiration. The pulse in each case retained its quality, the only change being in its rapidity. Each of the four men denied the presence of headache or other disagreeable symptoms, although the writer suffered from quite a severe headache. All felt tired and relaxed at the close of the experiment and without appetite for the evening meal. Drowsiness quickly supervened upon the restlessness after quitting the bathroom. No effects were experienced by the men the next day.

Observations of a somewhat similar character were made upon seven men of a baseball squad. The men were seen on three of the hottest days in August, the temperature according to Manila observation, reaching 93° F. each day and the relative humidity approximately 80 per cent. The sun temperature on the field could be made to register up to 130°, according to how much reflected heat reached the instrument. During the time, the sky was cloudless but there was a very moderate wind. The observations were taken after about two hours of hard baseball practice, from 1.30 to 3.30 in the afternoon. The men were perspiring freely and most of them were red of face from the exercise. The average of the temperatures taken under these conditions was 99°.5 F., the lowest being 99° and the highest 100°. The blood-pressure readings gave an average of 129.3 millimeters, the average at the beginning being 120.5 millimeters. It was not possible to get the pressures on all of the men after the effects of the exercise had worn off, but they were obtained in six cases, when the average was 121.5 millimeters, the same men giving an average of 129.5 millimeters after exercise.

THE CLIMATE.

The following short summary of climatic conditions in the Philippine Islands is introduced at this time so that the *important features may be fresh to the mind* in considering the final decision of the test. The climate varies somewhat throughout the Islands, but a consideration of the climate of Manila will answer for that of the entire lower elevation which comprises the great bulk of the inhabited parts of the Islands. To the newcomer who arrives in Manila, the climate seems

to be ideal during the first part of the year. Although the middle of the day is hot, the hours of the early morning, and those of the evening after 5 o'clock, are cool and the nights are sufficiently cool to render the use of a light blanket necessary. During the month of January there are occasional showers, but the rainfall is light. However, the average number of hours of sunshine is much above the mean for the year, and the humidity is relatively high. This complex of atmospheric conditions produces a climate which is very pleasant when one is shaded from the sun. Nevertheless, even light exercise such as walking quickly brings on profuse perspiration and as the moisture does not evaporate rapidly on account of the high humidity, it causes considerable discomfort. Even at night, walking is very likely to be associated with disagreeable perspiration.

As the year advances there is a gradual change in the climate; the temperature, still moderate through February, rises rapidly through the two succeeding months and reaches its maximum in May. The rainfall reaches its lowest figure in February, rising gradually through March and April, and rapidly in May. With this increase in rainfall there is a corresponding rise in vapor tension, but this increase is not as rapid as that of temperature, so that while the actual amount of vapor in the air is increasing, the relative humidity falls steadily until April, when it bounds upward during the two following months. In number of hours of sunshine there is a steady rise to include the month of April, after which there is a sharp decline.

The months of April, May, and June comprise the season which without doubt is the most disagreeable of the year. The temperature reaches its maximum in May, however it is only slightly higher than in the other two months. The relative humidity, low in April, rises rapidly during the two following months. The rains, although they are more frequent, are not sufficient materially to affect the temperature, and in the early part of this season there is a great deal of sunshine. Another feature which adds to the discomfort of this season is that it is the time for the change in the monsoons from the northeast to the southwest, and there is no regular monsoon blowing. Such winds as do prevail are likely to be gusty and changeable and to help little toward modifying the temperature. In this season any exercise is accompanied by profuse sweating, and the shade of a room frequently is not sufficient to render conditions comfortable. Even at night, it is at times so hot and humid that there is great discomfort trying to sleep, because of excessive perspiration.

With the establishment of the southwest monsoons in June there is an increase in the rainfall, which, together with the winds, materially affect the climatic conditions. During the succeeding three months rains are of almost daily occurrence and typhoons are liable to occur. The temperature still maintains a high mean and the humidity is high. The

sun is not visible as often as earlier in the year, but when it does shine its heat, combined with the moisture in the air, renders the climate very hot. Conditions as to personal comfort are much the same as during the preceding season except that the discomforts are of a less degree. The heat moderates in October, both vapor tension and relative humidity are less, and the rainfall decreases greatly. The changes continue, until by the first of December the conditions as described for January are again approximated.

The following table is a summary of the climatic conditions in Manila. These figures are prepared from the reports of Rev. José Algue, S. J., Director of the Philippine Weather Bureau, and in most instances are the averages for a number of years. The temperatures have been reduced to the Fahrenheit standard and the metric measurements to inches.

Month.	Temperature			Humidity.		Precipitation (average monthly).	Wind.		Hours of sunshine (daily average).
	Mean.	Mean maximum.	Mean minimum.	Mean relative.	Absolute.		Prevailing direction.	Velocity per hour (average).	
	°F.	°F.	°F.	P.ct.	Gr.	inches.		Mphs.	h. m.
January.....	77	85.6	69.3	77.6	7.7	1.14	N.	4.8	6 13
February.....	77.7	86.9	69.1	74.2	7.4	0.39	E.	5	7 20
March.....	80.2	89.8	71.4	71.8	7.8	0.73	E.	5.8	7 57
April.....	83	94.3	73.8	70.7	8.5	1.08	E.	6.1	8 51
May.....	83.5	92	75.5	70.7	9.2	1	SW.	6.6	7 38
June.....	82.2	89.8	75.1	81	9.7	9.75	SW.	6.4	5 30
July.....	80.8	86.3	75	84.8	9.7	15	SW.	6.8	5 0
August.....	80.8	86.9	71.9	84.8	9.7	14.2	SW.	7.6	1 37
September.....	80.6	86.9	75	85.5	9.7	14.7	SW.	8.1	5 5
October.....	80.4	87.8	74	82.7	9.2	7.56	SW.	5.6	5 35
November.....	79	86.3	72.5	82	8.7	5.37	N.	4.1	5 24
December.....	77.3	85.4	70.7	80.7	8.2	2.27	N.	4.2	5 16
Annual.....	80.2	88.2	73	79.4	8.7	70.31		6	6 12

* The absolute humidity is expressed in grains of aqueous vapor per cubic foot of air.

The average person when discussing the climate of these Islands takes no middle ground: he either pronounces it ideal, thus ranging himself with a select minority, or else conveys the impression that there are no words in his vocabulary properly to express his disapproval of it. However, moderation in discussion is beginning to make its appearance and somewhere between these two opinions lies the truth. To the writer, the year appears to be divisible into two parts so far as personal comfort is concerned. That half of the year beginning with the first of October and ending with the last of March is a season when with little effort one can be comfortable, and three months in the middle of this season are almost faultless. On the other hand, the season from the first of

April to the last of September is one of great discomfort on account of heat, humidity and rainfall, and these discomforts are the greater in proportion to the amount of exposure to the weather. To those persons who are in the habit of saying that the heat of Manila is as nothing compared to that of certain parts of the United States throughout the summer, the following table will be of especial interest. The places in the United States are selected because they are the ones referred to as especially hot in summer and surely most of them would not be regarded as summer resorts. The following table gives the mean temperatures and humidity rates for these places for the month of July and the corresponding figures for Manila for the entire year.

TABLE X.

Locality.	Mean temperature.	Humidity.	
		Relative.	Absolute.
	° F.	P. ct.	Gr.
Chicago (July)	72.3	70.6	
New York (July)	73.7	79.1	6.3
St. Louis (July)	78.8	67.9	6.8
Washington (July)	77.0	71.0	6.7
New Orleans (July)	81.7	72.3	8.0
Jacksonville (July)	82.5	71.8	8.6
Manila (annual)	80.2	79.1	8.7

It will be seen from this table that it is only in the Southern States that the weather conditions of summer approximate those of the Philippines for the entire year. It is only when the Gulf States are reached that the mean summer temperatures reach the annual mean for Manila, and even then the humidity remains much lower. It is in no spirit of carping criticism that these comparisons are made, but only to point out that no mysterious influence need be invoked to account for deterioration, while we have with us the high mean temperatures and humidity that obtain in these Islands.

However, in view of these figures, it is only just to say that it is surprising how little actual discomfort is experienced from the climate. The chief factor in rendering these Islands as comfortable as they are is their location in the track of the seasonal winds. What the climate would be without the influence of the monsoons can be imagined only during the period of calm, when the monsoons are changing in April. Another factor is that the resident here realizes at once that it is necessary to adapt his clothing, his work and diversions, in fact his whole habits of life to the local conditions of the climate. To one who is unable to do this, as for instance the soldier in field duty, the climate must remain one of unusual severity.

SUMMARY AND CONCLUSIONS.

Before pronouncing judgment upon the results of this experiment it will be necessary to bring together and compare the recorded experiences heretofore. It can be conceded at once that compressed underclothing protects the body from the chemical rays of the sun at least so far as rays that act upon the photographic plates. As to the discoloration due to fading, this was extreme only when the clothing was exposed to direct sunlight and on the whole was not so great as to interfere with the success of the test. This fading undoubtedly created a prejudicial impression against the underwear, as after a few weeks of exposure it could not fail to outrage the sensibilities of the wearer.

In comparing the results of the various test made, the following evidence is adduced:

(a) There is a loss of weight in both groups, greater by nearly a pound per man in the hot season for the special group.

(b) Blood examinations show the two changes due to tropical climate—increase of red cells and loss of hemoglobin, more pronounced in the special group than in the white.

(c) Blood pressure shows a fall in both groups during the hot and rainy seasons with a return to about normal in the cool of December. The loss is greater during the middle of the year for the special group than for the white.

(d) Temperature, pulse and respiration all show a slightly higher rate for the special group than for the white. The differences are so slight that taken singly they would have no significance, but together with the rest of the tests, they are suggestive of more than accident.

(e) The evidence adduced from the comparative sickness record is negligible except that admissions from heat exhaustion and febrile reaction of the latter probably due to heat, were not reduced by wearing the special underwear.

(f) Symptoms due to heat about balance in the two groups, so that there was apparently no benefit derived by the special group.

(g) After giving due weight to the prejudice against the color red, the persistent complaints of greater heat, greater weight and increased perspiration lead to the conclusion that the colored garments are more receptive to heat rays than are the white. The experimental results above support this view.

The physiological effects of the climate here shown in loss of weight, lowered blood pressure and increase in temperature, pulse and respiration, have been reproduced experimentally in an examination of the influence of moist heat without the aid of the sun's rays. That these effects can so constantly be produced can not be questioned. On the other hand, there is no evidence that these effects can be brought about by the sun's rays alone, and ordinary experience teaches us that they are not so produced. It is a strongly suggestive fact that the stress of the climate, as evidenced by loss of weight, depressed blood pressure, in-

creased temperature, pulse, and respiration, with heat strokes and febricula, is felt by the system during the hot and moist days of May to October rather than during the bright days of January to May. The rôle that humidity plays as an adjunct to heat is that of an interference with heat loss by evaporation. As evaporation from the skin is the main process by which a balance is maintained between heat production and heat loss, such an interference is serious. With a high external temperature and heat loss practically abolished by humidity, we have, as Sutton says, a vicious circle established. With the rise of internal temperature, oxidation in the system is increased with production of more heat and a still greater rise in body temperature. The progressive action of these factors on temperature, pulse and respiration are well illustrated in the experiments with moist heat described heretofore.

The photographic work with skins of varying pigmentation suggests that such pigment is of no great protection from actinic rays. It is probable that the effects of the chemical ray are exhausted upon the skin alone. Even in the deeper layers of the skin there is a constantly circulating layer of blood which is probably much more efficient as a protection against the chemical ray than is the permanent layer of pigment. If the effect upon the skin can be accepted as a measure of actinic influence, then the khaki is of itself sufficiently protective. Many men have their arms protected only by one layer of khaki material and after years of service in the Tropics have no more pigment in the skin thereof than they had upon arrival.

A final judgment then is that the test underclothing has added materially to the burden of heat upon the system, a burden which undoubtedly is the great cause of tropical deterioration. To balance this, it is protective against the chemical ray, the influence of which is regarded as of little moment, and which is sufficiently excluded by khaki clothing and the campaign hat worn at present. Certainly no beneficial effect whatever was observed from the use of this clothing. This experiment suggests that any efforts toward increasing the physical well-being and efficiency of the soldier shall be directed toward protecting him from the debilitating effects of heat and humidity. One effect quite aside from these factors is that upon the eyes. We see here the result of the sunlight in many distressing symptoms, but these are probably due to the light rather than to the chemical rays. Any protection afforded the eyes from the glare of the tropical sun deserves to be heartily welcomed.

In closing I wish again to acknowledge the valuable work done by Major C. C. Collins, Lieutenants G. L. McKinney, Hiram A. Philipps, and C. D. Cowles, Jr., Medical Corps, in supervising the details of this test. Credit is also due to Captain Henry J. Nichols, Medical Corps, for assistance in outlining the experiment, and to Captain James D. Fife, Medical Corps, who placed his photographic appliances at our disposal.

TREATMENT OF STRYCHNINE POISONING WITH CHLOROFORM.

By A. O. SHAKLEE.

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An experimental study of the treatment of strychnine poisoning was begun by the author earlier in the present year under the direction of Dr. S. J. Meltzer in the laboratory of the Rockefeller Institute for Medical Research, New York City. Two communications have since been published¹ in which reports were given of the treatment with curarin and artificial respiration by the continuous intratracheal insufflation of air by the Meltzer-Auer method. Another paper will soon be published on the treatment with ether. It was found in these earlier investigations that the lives of nearly all, if not all, dogs poisoned with twice the fatal dose of strychnine administered intravenously can be saved by the proper application of either of these methods. In the treatment with curarine, a small dose of atropine and considerable quantities of Ringer's solution administered intravenously together with artificial respiration seemed to be essential to success. In that with ether, recovery could be secured with ether alone, but the course of treatment was shortened by the intravenous administration of Ringer's solution, and rendered more certain by an exact regulation of the dosage of ether by means of insufflation and a mixing valve² for mixing the ether vapor with air in definite and constant proportions. The treatment with curarine seemed to demand close and constant supervision, while that with ether required comparatively little attention and caused no anxiety.

In the present investigation it is proposed to make a comparative study of the treatment of strychnine poisoning by means of ether and by means of chloroform. This seems desirable because of the fact that works on toxicology recommend the use of chloroform or ether without comment on their relative merits, or recommend chloroform without mentioning ether; and it seems important in view of what is already known of their relative toxicities to have some definite experimental

¹ *Proc. Soc. Exp. Biol. & Med.* (1910), 7, 96-97; *Berl. klin. Wchnsch.* (1910), 39, 1776-1778.

² *Proc. Soc. Exp. Biol. & Med.* (1910), 7, 158-160.

results upon which to base the treatment of convulsions by the use of general anesthetics.

The *method* of the present study in its main features is as follows: The preparation of the animal (1) for intratracheal insufflation with air mixed by means of the anæsthetic regulator² with the vapor of the anæsthetic; and (2) for intravenous injection of drugs and of Ringer-Locke solution warmed to the body temperature. In some cases a preliminary small dose of morphine, or atropine, or both is given. Since the non-anesthetized animal which has not been treated with curarine, is thrown at once into a violent tetanic convulsion by the intravenous injection of strychnine sulphate in the dosage used, and since the spasm of the respiratory muscles may render the introduction of the anæsthetic difficult and hazardous, an attempt is made to bring the animal to such a stage of anæsthesia before the administration of the strychnine that no convulsions or only slight ones would result. At times the anæsthetic is administered by means of insufflation in connection with the anæsthetic regulator, at other times it is automatically administered by the dog's inspiration, the tracheal catheter being in connection with the regulator. The amount of Ringer-Locke solution injected in each case is equivalent to about one-tenth of the body weight and the duration of the injection varies from one-half hour to two hours. The quantity of strychnine administered varied from 0.6 to 0.8 milligram per kilogram of animal. In control experiments 0.4 milligram per kilogram proved invariably fatal to the untreated animal. When morphine or atropine is used, the quantity of morphine is sufficient to produce more or less depression and that of atropine large enough to liberate the heart from vagus inhibition.

The two protocols given below will show the course of the more successful cases of treatment with chloroform:

Protocol No. 4.—Dog No. 4, 12.5 kilos ♂, Brn. & Wh., 5 years old (?), seems healthy, rather lean.

8.25 a. m.: 1 cubic centimeter morphine sulphate (4 per cent aqueous solution) injected subcutaneously.

8.38: Pupils small.

8.45: Chloroform was administered by means of a cone. [In spite of care, an overdose of chloroform was given in this case and heart and respiration stopped. A tracheal catheter was inserted through the mouth and artificial respiration by insufflation together with thoracic (heart) massage were begun. The heart soon began to beat slowly but it was only after some minutes and after repeated strong traction on the tongue that voluntary respiration was initiated]. The tracheal catheter (a piece of rubber gas tubing) was connected with the anæsthetic regulator and valve set $\frac{4}{6}$ full, i. e. was moved $\frac{4}{6}$ of the part of a revolution necessary to send all the air through the anæsthetic bottle.

9.07: Chloroform $\frac{4}{6}$ does not keep this dog under, owing to the excess in size of glottis over tracheal catheter. Pulse soft and irregular.

² *Loc. cit.*

9.13: Chloroform 3/6 and trachea compressed closer to tracheal catheter by gentle outside pressure keeps the dog sufficiently anesthetized for operation.

9.20: Pulse 66, full, fairly strong, drops a beat occasionally.

9.52: Pulse 60, full, strong, regular. Respiration 21, deep; expiration prolonged, and forcible. The pinching of the toe produces slight reflex. Pupils the size of pinhead.

9.56: Gently compressing trachea more closely on tracheal catheter increases percentage of chloroform sufficiently to abolish reflex from the pinching of the toe. Lid reflex sharp.

9.58: 0.83 cubic centimeter strychnine sulphate (1 per cent aqueous solution) injected slowly into femoral vein along with Ringer-Löcke solution.

9.59.5: Violent tetanus with rigidity of respiratory muscles and cessation of respiration. Thoracic massage and insufflation of dilute chloroform vapor maintained life and reduced the convulsion.

10.20: Chloroform 2/6+; voluntary movement; voluntary respiration; premonitory symptoms of convulsion.

10.21: Chloroform 4/6.

10.23: Chloroform 3/6—Ringer solution increased in rate.

10.27: Chloroform 3/6—Ringer solution increased in rate.

10.29: Chloroform 3/6—insufflation stopped. Compression of trachea onto catheter increases percentage of chloroform sufficiently to stop respiration.

10.35: Chloroform 2/6—insufflation.

10.45: Voluntary respiration weak. Ringer solution injection increased in rate.

11.02: Voluntary respiration fairly good. Lid reflex good. Rate of Ringer solution injection is about 20 cubic centimeters per minute.

11.45: The pinching of the toes causes slight reflex, but no symptoms of convulsions.

11.47: Injection of Ringer solution stopped. Total quantity injected=1,300 cubic centimeters.

11.50: Dog is hypersensitive—chloroform increased to 5/12.

11.55: Hypersensitive—chloroform increased to 6/12.

11.59: Chloroform reduced to 2/6.

12.04: Hypersensitive—chloroform increased to 3/6.

12.07: Compression of trachea removed.

12.10: Dog passes 2.5 cubic centimeters of very bloody urine.

12.26: Chloroform 2/6. Eyes closed.

12.28: Chloroform turned off. Dog breathes strongly and remains quiet.

1.10: Fairly strong clonic convulsions begin. They are brief and separated by intervals of only a few seconds during which the respiration is labored. Noises increase the strength of convulsions or bring them on. The convulsions are not so violent as to demand treatment.

2.20: Convulsions have practically ceased, 500 cubic centimeters of urine of nearly normal color passed. Respiration about 230 per minute and shallow with frequent short pauses.

2.26: Attempts to get onto feet.

2.40: Still hypersensitive.

2.45: Rose on his fore feet and stood for a time, but then failed in attempt to rise on his hind feet.

2.47: Rose on all four feet; legs very stiff, mild tetanic dance.

3.00: Able to walk fairly well, but staggers; lack of control is most marked in hind legs. Considerable exophthalmos.

4.30: Lying quietly; eyes closed; breathing 24 per minute, quiet, regular, practically normal. Pulse 60, full, strong, slightly irregular. Starts when disturbed. Refused drink.

On the next day the dog seemed in full possession of its faculties, but somewhat stupid or listless. On the third day the dog ate and drank, but was still stupid. Later on it began to decline and on the seventh day died. The gross appearance of the organs after death was not strikingly abnormal, but the lungs, heart and kidney seemed congested. A microscopic study of the organs will be made later.

Protocol No. 8.—Dog, 9.1 kilos, ♀, Brown native, lean, probably 5 years old, mangy.

1.25: 1 cubic centimeter morphine sulphate (4 per cent) subcutaneously.

2.00: 0.5 cubic centimeter atropine sulphate (1 per cent) intravenously.

2.05: Chloroform 2/6 with insufflation.

2.11: Chloroform 5/12, pulse 140 soft, marked venous pulse in neck, respiration 40, moderately deep, slightly irregular.

2.17: Pulse 156, respiration 48, shallow, irregular.

2.19: 0.73 cubic centimeter strychnine sulphate (1 per cent) injected with Ringer-Locke solution, the injection of the latter solution was continued.

2.20: Strong tetanus, chloroform 3/6 with insufflation.

2.21: Eyes open and pupils wide. No convulsions, but limbs held in extension, Respiration shallow.

2.23: No lid reflex. Slight rhythmic movement of hind legs.

2.31: Chloroform 5/12 with insufflation. No lid reflex. Respiration 42, deep, fairly regular.

2.37: Lid reflex fairly good. Chloroform 3/6 with insufflation.

2.39.5: No lid reflex, chloroform 5/12 with insufflation.

2.44: Slight lid reflex, foreleg still in extension and hind leg still in rhythmic motion.

2.55: Chloroform 2/6 with insufflation.

2.59: Lid reflex good, respiration good, rhythmic movements of fore legs, pulse 168, small, moderately strong, regular.

3.13: Fore leg relaxing.

3.24: Hypersensitive, lid reflex sharp, heart and respiration in good condition.

3.30: Sudden start, chloroform increased to nearly 5/12 with insufflation.

3.44: Injection of Ringer-Locke solution stopped. 900 cubic centimeters in all.

3.55: Chloroform 2/6.

4.01: Chloroform and insufflation off.

5.00: The dog has gradually recovered from the chloroform and is now attempting to rise to its feet.

On the following day the dog seemed normal, bright and strong; but the third day at 8.15 a. m. he began to droop and at 9 a. m. died quietly, about forty-eight hours after the beginning of the experiment. At autopsy the heart and liver were found very pale and yellow, suggesting marked fatty degeneration. The same appearances were found at other autopsies.

Results.—Of the first ten dogs of this series, one was given a small dose of curarine followed later by ether. This was the only one of the series that made a permanent recovery, in spite of the fact that the treatment was carried out by third-year medical students without previous experience in treatment of strychnine poisoning. The remaining nine dogs were treated with chloroform. Some had morphine as

a preliminary, some had both morphine and atropine, and some had neither. Four of these dogs were saved from strychnine death but, these four died subsequently, apparently from chloroform poisoning. Two of the four had a small dose of morphine each, as a preliminary; one had morphine and atropine, and the fourth had neither.

Discussion.—A comparison of these nine cases treated with chloroform with the series of eleven treated with ether by the writer at the Rockefeller Institute, brings out a marked difference in the results of the two methods. Of the eleven dogs treated with ether only one failed to make a permanent recovery, and to that one the anæsthetic was administered by means of a cone provided with a wad of cotton soaked with ether. But of the nine treated here with chloroform none made a permanent recovery. At present it hardly seems possible to improve upon the treatment with chloroform as exemplified in protocol number 8, to a degree that will remove the danger of subsequent chloroform death.

CONCLUSIONS.

1. Dogs poisoned with doses of strychnine which are certainly fatal may recover from the effects of the strychnine if properly treated with chloroform together with the intravenous injection of liberal quantities of Ringer-Locke solution.
2. Better results are obtained if the chloroform is given by intratracheal insufflation and in uniform concentration as low as consistent with the condition of the patient.
3. Dogs saved from strychnine death by means of chloroform are likely to die later of chloroform poisoning.
4. Chloroform is far inferior to ether for the treatment of strychnine poisoning, and probably for the treatment of convulsions in general.
5. Further experiment is necessary to determine the merits or demerits of atropine and of morphine in the treatment with chloroform of strychnine poisoning.

THE BONE LESIONS OF SMALLPOX.

By W. E. MUSGRAVE and A. G. SISON.

(From the Department of Clinical Medicine, Philippine Medical School,
Manila, P. I.)

Eight patients have been admitted to our service during the past year, who were suffering from deformities of the forearms and hands caused by smallpox contracted during childhood. The following brief abstracts of that part of the records of these patients which bears upon the subject under consideration, together with photographic illustrations showing the deformities in six of the cases are submitted. We are unable to give radiograms because there is no satisfactory Röntgen apparatus at present available in Manila.¹

Case I (Plate I, figures 1 and 2).—A. P., Filipina, 30 years old, born in Orani, Bataan, housekeeper, married, was admitted to St. Paul's Hospital July 27, 1910, because of labor and was delivered of a normal child on July 27, 1910.

The patient had a marked deformity of both forearms and hands which she states had followed an attack of smallpox contracted when she was about two years of age. The deformity (see figures 1 and 2) consists of a shortening of both forearms together with enlargement and irregular development about the elbow joints and irregular enlargements, shortening and other deformities of the bones of the wrist, hands, and fingers. The musculature, circulation and nerve supply in the deformed areas appear normal, except that there is some irregularity in the course of the vessels and the function of the forearms and hands is awkward and not complete, due to the abnormal relations about the joints and to the very definite shortening of the long bones. There are no subjective symptoms of any kind which may be associated with the lesions and there are no scars, contractions nor other evidences of an objective character or in the history which would indicate that the process was the result of an acute inflammation such as is sometimes seen about the joints in smallpox.

Case II (Plate II, figure 1).—B. P., Filipina, 19 years old, born in Orani, Province of Bataan, housekeeper, married, was admitted to St. Paul's Hospital July 25, 1910, because of labor and was delivered of a normal child on July 31, 1910.

The patient gave a history of smallpox at the age of 8 years, as a result of which she developed deformities in both forearms consisting of shortening of the radius and the ulna. The shortening is more marked in the left forearm than in the right. The articular surfaces in the elbow joint and in the wrist joint of the

¹ Such an apparatus has arrived and is now installed in the new Philippine General Hospital. (Editor.)

ulna and the radius are enlarged and irregular. Motion in these joints is fair in every direction, and there are no signs of abnormal limitation of movements. Musculature in good condition.

Case III (Plate II, figure 2).—V. P., Filipino, 33 years old, single, born in Santa Cruz, Province of Marinduque, was admitted to St. Paul's Hospital on August 22, 1909, because of chronic gastritis and was readmitted to the same hospital for the same trouble on November 11, 1909.

When 8 years old, the patient had smallpox. The attack was followed by deformity and shortening of the ulna and the radius in both forearms, more pronounced in the left arm. Changes in the articular surfaces of the bones are the same as those described in the above cases. No deformity in the bones of the hands and fingers.

Case IV (Plate III, figures 1 and 2).—N. D., Filipino, about 25 years old, single, born in Santo Tomas, Province of Union. He came to the Free Dispensary complaining of beriberi.

When 5 years of age, the patient had smallpox which was followed by deformity and shortening in the bones of the forearms, more in the left than in the right forearm. No bone changes in the hands and fingers. Joints apparently not involved.

Case V (Plate IV, figure 1).—N. de la C., female, Filipina, 7 years old, born in Manila. History of smallpox at 3 years of age which was complicated by bone and joint lesions; the complications at present consist of bony ankylosis of the left elbow joint with distortion of the joint due to irregularities in the bones; apparent shortening of its ligaments about the right elbow and an enlargement of the end of the radius which gives deformity of the joint.

Case VI (Plate IV, figure 2).—P. S., male Filipino, 38 years old, born in Manila. History of smallpox at the age of 7 years, complicated by bone and joint lesions. At the present time deformity consists of shortening of both humeri, deformity of the left wrist with shortening of the ulna.

(Cases V and VI both show extensive smallpox pitting over the principal areas of deformity.

Two other cases with histories similar to the above have failed to report to be photographed. Lesions similar to those described in the other cases were present in these patients.

DISCUSSION.

We have been unable to find in the literature of smallpox any mention of lesions similar to those here described. A condition involving changes in the bone marrow is recognized in a considerable percentage of cases of smallpox, and acute suppuration and other forms of acute arthritis occasionally are encountered in the disease. Paraplegia, due to lesions in the cord, are reported, and Osler mentions that "inflammatory process may occur in the bones."

However, none of these conditions are at all comparable to the findings in our cases, and for this reason it is necessary to elucidate two questions. (a) Are the deformities caused by smallpox? (b) If so, what is the nature of the lesion and what is its exact etiology?

The considerable number of cases with a similar history of smallpox

during infancy and childhood followed by gradual development of the deformities, and in the absence of any other apparent cause, makes it fairly certain that the condition is caused by smallpox. Additional evidence of some value is found in the popular recognition of the condition as one of the complications of variola to such an extent that it is one of the occurrences most dreaded by mothers when they find that their children are suffering from the disease. The nature of the lesions could better be determined by the use of radiographs or by autopsies.

However, from the nature of the deformities and as a result of physical examination, the process appears to be due to destructive lesions in the epiphyses of the bones. The shafts of the ulna and radius seem to be normal, except in length. The ends of the bones are enlarged and irregular in shape and similar changes may be encountered in the carpal, metacarpal and phalangeal bones.

One of the most striking features of the deformities is the constant location of the lesions in the upper extremities, they usually being confined to one or both forearms, although they occasionally extend to the hands, as is shown in the illustrations.

The reason for not studying our cases with the X ray has already been given, and up to the present time we have not been able to examine any individual postmortem. However, in spite of the absence of radiographic pictures of the bones in question, it may be determined with considerable accuracy that the probable seat of the primary lesion which has prevented the further longitudinal growth of the bones is produced by the nature of the gross anatomical changes in the bone itself. To begin with, we have the following facts on which to base our argument:

- I. The circumferential growth of these bones is not disturbed in the least. There is no sign of underdevelopment in diameter, as can be proved by comparing them with normal bones. This shows that the periosteum upon which the circumferential growth depends, was not affected.

- II. The bones are markedly shortened and stunted in longitudinal growth, in some instances they are reduced to more than one-half the length of the normal bone.

The obvious conclusion from this fact is that the seat of the primary lesions is in that active part of the bone between the epiphysis and diaphysis which grows *ex utero*. This center of ossification consists of cartilage cells, upon which the longitudinal growth depends and which do not become calcified or ossified until late in life. Complete ossification of the ulna takes place from the twentieth to the twenty-third year; of the radius from the twentieth to the twenty-fifth year; and of the metacarpal and phalangeal bones at about the twentieth year. At the end of these periods of time, the diaphyses and epiphyses become firmly united and longitudinal growth ceases.

Is it not logical to reason *a posteriori* that the most probable cause of the deformity is primary inflammation and destruction of the secondary center of ossification situated between the epiphyses and diaphyses, resulting in premature ossification?

Another possible explanation of the deformity is that metabolic disturbances in the epiphysal cartilages have been induced by variola without primary, destructive lesions appearing in the cartilage itself. However, such a conclusion is hardly tenable if we remember that the articular cartilages of the affected bones show positive signs of irregular enlargement, bearing on them evidences of the ravages of a preëxisting inflammatory process underlying the whole trouble.

The special predisposition of the bones of the forearms and hands to this complication remains as the most difficult fact to explain. So far as we have been able to observe, the change does not occur in bones other than those which have already been mentioned; and such a complication is always seen in infancy and childhood during the period of active growth of the bones.

Additional note.—We have mentioned the shortening of the bones of the forearms, and also deformities in their articular surfaces; and while our article was in the press two more cases of bone lesion in smallpox of different character from those already mentioned came to our notice, the pictures of which are here represented. One is that of a girl (see Plate IV, figure 1) about 9 years of age, who contracted smallpox when she was about 3 years old. As a result of the disease, she developed complete ankylosis of the right elbow-joint and partial of the left. Whether the ankylosis is bony or fibrous in character is difficult to say, though there are reasons for believing that the ankylosis in the right elbow-joint is of a bony character, as it is not possible to elicit the slightest motion in any direction, while that of the left is evidently produced by shortening of the particular ligaments of the elbow-joint.

The other case is that of a man (see Plate IV, figure 2) about 50 years old who contracted smallpox at the age of about 7 years, with a resulting complication of shortening of both humeral bones.

ILLUSTRATIONS.

PLATE I.

FIGS. 1 and 2. Case I. Showing marked deformity of both forearms and hands.

PLATE II.

FIG. 1. Case II. Showing shortening of ulna and radius in left forearm and deformity of right hand.

2. Case III. Showing shortening of both right and left forearms.

PLATE III.

FIGS. 1 and 2. Case IV. Showing deformity of both right and left forearms, more of left than right.

PLATE IV.

FIG. 1. Case V. Showing bony ankylosis of the left elbow joint with distortion of the joint.

2. Case VI. Showing deformity of both right and left forearms and of left wrist.



PLATE I.



PLATE II



PLATE III.

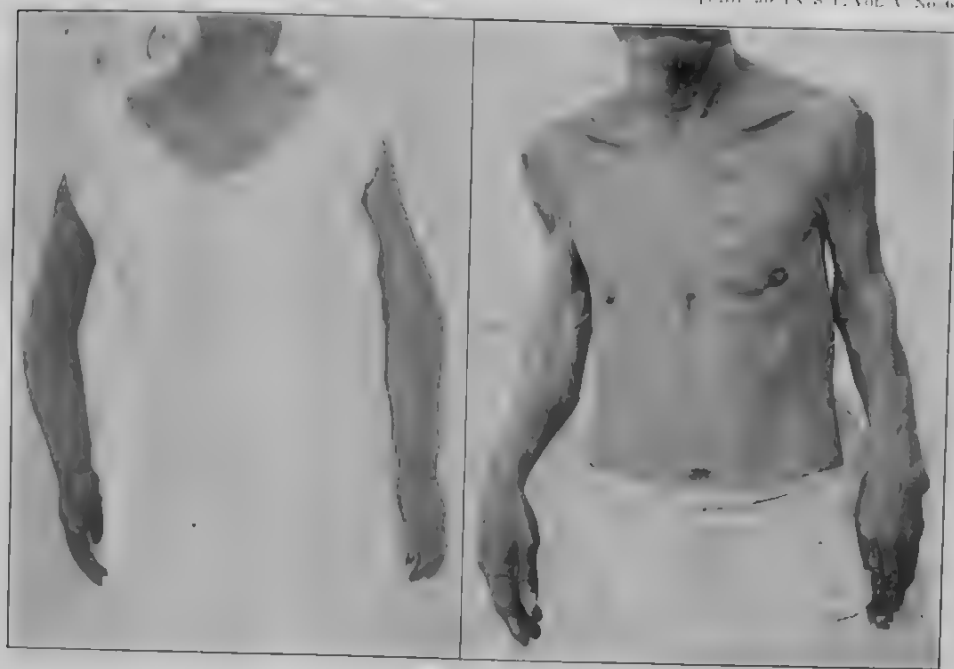


PLATE IV.

THE SPECIFIC TREATMENT OF LEPROSY.

By EUGENE R. WHITMORE¹ and MOSES T. CLEGG.

(From the Biological Laboratory, Bureau of Science, Manila, P. I.)

Some months ago one of us² reported that he had cultivated an acid-fast bacillus from the spleen and from nodules from the ear in eight out of ten cases of leprosy. The procedure was to secure an amoeba and a bacillus growing well in symbiosis and then inoculate the leprosy tissue into this culture. The acid-fast bacillus was found to multiply in and around the amoebæ, while controls from leprosy tissue without amoebæ and from normal tissue with amoebæ never gave a growth of an acid-fast bacillus. Clegg was able to transplant this acid-fast bacillus with the amoebæ and after repeating this operation for several months, he heated the tubes containing the cultures to 60° C for one-half hour and then allowed them to stand. After a few days, isolated colonies appeared on the tubes, and when transplanted they grew well on all media. These colonies proved to be pure cultures of this acid-fast organism, which we believe to be the leprosy bacillus.

The next step was the endeavor to utilize this bacillus in the treatment of leprosy. A vaccine was made in the ordinary way and standardized to five hundred thousand bacteria per cubic centimeter. The bacteria in this vaccine showed a great tendency to form clumps on being allowed to stand without shaking. We selected a number of well-marked cases of leprosy, all being positive for the leprosy bacillus. Injections were given once a week, the dose varying from 0.25 to 1 cubic centimeter. Several of the patients after the injections had local reactions in the leprosy lesions, such as redness and swelling, and some pemphigoid eruptions; while two of the cases showed an extensive eruption of papules which were very red and tender. As the various eruptions disappeared, the skin remained pigmented at the site of the eruption. Upon increasing the dose of our vaccine we found that the dead bacteria were not absorbed, but remained at the

¹ Major, Medical Corps, U. S. Army; detailed to Biological Laboratory, Bureau of Science, Manila.

² Clegg, *This Journal*, Sec. B (1909), 4, 403.

site of the injection, and finally a small abscess would form and discharge a sero-purulent material.

Eleven cases of leprosy were treated with this vaccine for eight months, and twenty-one for seven months. At the end of the treatment there was no evidence of improvement in the condition of any of the cases, and, as we observed the formation of abscesses as soon as we increased the dose, it was decided to change to some other preparation.

We next employed a glycerine extract made from our acid-fast bacillus in the same way that old tuberculin is obtained from the tubercle bacillus. We tried the extract on leprosy, tuberculous, and normal persons in the manner of the von Pirquet skin test for tuberculosis. Not one of the persons showed any reaction to the material.

We gave all the cases of leprosy in our vaccine series injections of this extract once a week, increasing the dose until 10 milligrams were administered at a dose at the end of two months. None of the patients had improved and no reactions had followed the injections.

Our next preparation was an emulsion of our acid-fast bacillus in a 1 to 60 aqueous solution of sodium oleate. The cultures on glycerine agar were scraped off and emulsified in the soap solution, so that one cubic centimeter of the solution would contain one milligram of moist bacteria. This emulsion was placed in the shaking machine for three days and then heated to 60° for one hour. The bacteria were nearly dissolved, there being only a slight sediment on allowing the solution to stand. When the preparation was shaken, the sediment was distributed freely through the solution without any tendency to form clumps. This preparation was sterile and remained so without the addition of any other preservative.

All the leprosy cases in our vaccine series were given injections of this new vaccine once a week. The dose was gradually increased until the patients were receiving one cubic centimeter of the emulsion, representing one milligram of moist bacterial substance, at a dose. Two cases developed a sharp reaction, with fever and malaise. There was considerable swelling and redness around the leprosy lesions, especially on the face, hands, and feet. In no case was there local reaction at the site of injection, and no abscesses were observed. At the end of two and one-half months there was no improvement in the condition of any of the patients.

We next employed the spleens of patients dead of leprosy. We chose a spleen that was shown microscopically to be very rich in leprosy bacilli. We ground up this tissue and added a 1 to 60 aqueous solution of sodium oleate, so that one cubic centimeter of the resulting mixture would represent 0.5 gram of spleen substance. This mixture was shaken in the shaking machine for three days, filtered through cotton, and heated to 60° C for one hour. On standing, a small amount of sediment col-

lected at the bottom, leaving the supernatant fluid clear and yellowish in color. This clear fluid was used for the injections. It was sterile and remained so without the addition of any other preservative.

All of the leprosy cases in our vaccine series were given injections of this preparation once a week. The dose was gradually increased until the patients were being given one cubic centimeter of the solution, representing 0.5 gram of leprous spleen tissue, at each injection. The cases have been receiving injections of this preparation for two and one-half months. None of them show any improvement in their condition and none of them have had any reaction after the injections.

When we started our vaccine work we put three cases of leprosy on weekly injections of atoxyl, and three on weekly injections of a mixture of sodium cinamate and mercuric cinamate. Injections were continued in these cases for eight months. None of the patients improved and none had reactions after the injections. We put our three "cinamate" cases on injections of sodium cinamate and a glycerine extract of our acid-fast bacillus, but at the end of three months there was no improvement and we discontinued the method of treatment.

Deycke injected cinnamic acid in order to produce a leucocytosis, and observed a greater reaction from Nastin in conjunction with cinnamic acid than from Nastin alone, but otherwise there was no result following the cinnamic acid injections.

At the time we began the specific treatment of our series of cases of leprosy, for nine months Doctor Teague³ of this laboratory had been treating six cases of leprosy with injections of Nastin. He turned these patients over to us and we further treated them with the same injections for eight months. Every seven days each individual was given an injection of one cubic centimeter of Nastin B. At the end of eight months there was no improvement in the condition of any of the patients and none had any reaction after the injections.

SUMMARY.

1. We have prepared a vaccine, a glycerine extract and a soap solution, from an acid-fast bacillus which Clegg cultivated from leprous tissue. We have used these preparations in the treatment of cases of leprosy for twelve and one-half months, without noting any improvement in the condition of any of the patients. In some of the cases we have noted reactions after the injections, but we are not prepared to say whether or not these reactions are specific.

2. Our glycerine extract of this organism does not produce a skin reaction on leprous or tuberculous patients, nor on normal persons.

³ *This Journal*, Sec. B (1909), 4, 329.

3. We have treated these same leprous patients for two and one-half months with a soap solution of leprous spleen, rich in leprosy bacilli, without noting any improvement in the condition of the patients.

4. We have treated cases of leprosy for eight months with injections of atoxyl and also with injections of a mixture of sodium cinnamate and mercury cinnamate, without noting any improvement in the patients.

5. We have treated cases of leprosy for eight months with injections of Nastin B. These patients already had been treated with injections of Nastin B for nine months by Doctor Teague. At the end of the seventeen months, no improvement was noted.

TUBERCULOSIS IN THE PHILIPPINES: FINAL RESULT OF ONE YEAR'S SPECIFIC TREATMENT OF EIGHTY CASES OF PULMONARY TUBERCULOSIS.

By EUGENE R. WHITMORE.¹

(From the Biological Laboratory, Bureau of Science, Manila, P. I.)

In January, 1909, I selected one hundred cases of pulmonary tuberculosis in the hospital at Bilibid Prison and divided them into five series for the purpose of testing several "specifics" in their treatment.

In August, 1909, I gave the conditions governing the selection of the series, and also reported the result of the treatment at the end of six months.² At that time I stated that at a later date I would publish a final report. The treatment was continued for one year, and the table below gives the result compared with a control series.

Series.	Died.		Returned to duty.		Remaining in hospital.		Re-leased.
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	
1. Tuberculin:							
A. By mouth.....	2	20	*3	30 or 20	3	30	2
B. Hypodermically.....	1	40	3	30	3	30	0
Total for tuberculin series.....	6	30	*6	30 or 25	6	30	2
2. Succinimide of mercury.....	9	45	3	15	7	35	1
3. Atoxyl.....	9	45	2	10	6	30	3
4. Cinnamate of mercury.....	4	20	7	35	8	40	1
5. Control series.....	4	20	4	20	9	45	3
Total.....	32	32	*22	22 or 21	36	36	10

^a One case returned to the hospital two months after his discharge, with an active pulmonary tuberculosis.

^b One of the cases in the atoxyl series had gained 33 pounds in 35 days before his release.

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² *This Journal*, Sec. B (1909), 4, 453.

The tuberculins used were "new tuberculin (T. R.)" and "old tuberculin (T. O.)" They were mixed and the dose at the beginning was .0005 milligram T. R. and .0005 milligram T. O. This dose was gradually increased until the patients took .005 milligram T. R. and .005 milligram T. O.

The patients in the "succinimide of mercury series" received injections of 13 milligrams of succinimide of mercury every other day for fifteen doses; then 26 milligrams every four days for fifteen doses; and then 39 milligrams once a week.

Those of the "atoxyl series" received injections of atoxyl, soamin, or arsacetin: 65 milligrams every other day for fifteen doses, then 130 milligrams every four days for fifteen doses; and then 200 milligrams once a week.

The patients of the "cinnamate of mercury series" received injections of 18 milligrams of cinnamate of mercury every other day for fifteen doses; then 36 milligrams every four days for fifteen doses; and then 54 milligrams once a week.

The members of the control series received routine hospital treatment.

The cases taking succinimide of mercury and cinnamate of mercury experienced some trouble with sore mouths, especially in the early weeks of the treatment and the dosage frequently was cut down. Later, they bore the increased amounts better.

In all the series the dosage given above was used merely as a guide and was deviated from in individual cases as seemed advisable.

The treatment of all the cases was continued from January 14, 1909, to February 12, 1910, and the table gives the results up to the latter date.

CONCLUSION.

While the series is small and one must be very careful in drawing conclusions, still the result of this year's work seems to indicate that none of the "specifics" used by me were of especial value in the treatment of pulmonary tuberculosis in natives of the Philippines.

FURTHER OBSERVATIONS ON THERAPEUTIC INOCULATIONS OF BACTERIAL VACCINES.¹

By EUGENE R. WHITMORE.²

(From the Biological Laboratory, Bureau of Science, Manila, P. I.)

At the annual meeting of the Manila Medical Society in February, 1908, I made some observations on the therapeutic inoculation of bacterial vaccines and it is my purpose now to add new points that I have gathered in the past year. The field of bacterial vaccination is too well known to require any general discussion of the subject.

One of the points which I emphasized was that it was not necessary to take the opsonic index regularly in order to control dosage, but that the clinical course of most diseases was a sufficient indicator. We all know that everywhere this is now the accepted idea and very few men are depending on the opsonic index for their indications for treatment. I also spoke of bacterial vaccination in gonococcus infections and it is worth while to state my further experience in these infections. I do not see that in acute urethritis the vaccination in any way shortens the course of the infection, but I am of the opinion that it lessens the complications. However, it is difficult to say which cases would and which would not have complications under other treatment, and I know that bacterial inoculation does not entirely prevent complications, as I have seen an epididymitis develop in a case of urethritis that was being treated with vaccine.

In chronic urethritis the use of a stock gonococcus vaccine does not offer much hope. The infection here is usually mixed and it is necessary to make a vaccine from cultures obtained from the urethral discharge, or from prostatic milkings.

I have had several cases of from four to eight years' standing clear up in less than a month under treatment with a mixed vaccine and prostatic massage. These cases at the present time have remained entirely well for over six months. Some have improved under this treatment, while

¹ Read in part before the Philippine Islands Medical Association at Manila, P. I., on February 23, 1909.

² Major, Medical Corps, U. S. Army; detailed to the Biological Laboratory, Bureau of Science, Manila.

still others have not improved. In epididymitis the symptoms are usually relieved within twenty-four to thirty-six hours.

I have had five cases of gonorrhoeal conjunctivitis, all the diagnoses having been confirmed by finding the gonococcus in the discharge from the eye. Two of these (both natives) did not come back after the first injection, so nothing is known of the result. The other three cases cleared up promptly after injection and none have any opacity of the cornea. One of these cases was an infant, eleven days old. One man had gonorrhoeal conjunctivitis for two days. When the eyelids were separated the pus welled out. Thirty-six hours after the first injection the discharge from the eye was watery, and he made a prompt recovery with no opacity of the cornea. Some days later his vision was still low, but there was no apparent cause for it. I have been unable since to discover whether his vision returned to normal or not.

Gonorrhoea in women has not yielded satisfactorily to injections with a stock gonococcus vaccine in my hands. In one series I treated 110 women between March 16, 1908, and July 17, 1908. These were cases of urethritis, endometritis and bartholinitis and in all cases the presence of the gonococcus was determined by microscopic examination of stained smears. Of the 110 women, 31 came under treatment twice and 16 three times. They received in all 623 injections of stock gonococcus vaccine. There seemed to be some lessening of discharge in a few cases, but there was no evident shortening of the length of time during which the gonococcus was found in the discharge, and recurrences seemed to be just as frequent in the cases that received injections as in those that were not injected. From my experience with chronic urethritis it seemed to me that it would be necessary to make a personal vaccine in the cases of endometritis, and recovery was prompt in four cases of long standing so treated. One woman had been unable to do any work for two or three months and had been in bed a large part of the time because of pain in the pelvic region. There was considerable induration of the pelvic tissues as felt through the vault of the vagina, and examination was very painful to the patient. A vaccine made from the cultures taken from the cervical discharge was injected in conjunction with a stock gonococcus vaccine. After two injections the induration had disappeared and the woman resumed her household duties, including the regular laundry work.

Another series of cases of gonorrhoea in the female was treated by making a personal vaccine for each case and injecting it in conjunction with a gonococcus vaccine. When possible I prepared a personal gonococcus vaccine, but this was feasible in only a very small number of cases. A vaccine was made from the other organisms grown from the cervix in each case and this was combined with a gonococcus vaccine—personal when possible, otherwise stock.

Between December 1, 1908, and June 1, 1909, 156 patients were

treated, and were given 653 injections of combined personal and gonococcus (stock or personal) vaccine. The results from this series were not any better than were those from a stock gonococcus vaccine alone.

My results in gonorrhœal arthritis have been excellent. I have treated 18 cases and have reports of 12 more that were treated with vaccine sent out by me, in all of which recovery has been prompt and complete. I recently have learned of three cases in which the outcome has not been satisfactory: two showing only moderate improvement after several injections, and one showing no change after a single injection.

The results of bacterial vaccination in chronic suppurative otitis media have been very satisfactory. I have treated, or prepared the vaccine for treatment of 51 cases. Three of these could not be followed. In 37, the discharge stopped after from one to four injections of a personal vaccine. In 11, the discharge did not stop after a prolonged course of injection. In six the discharge recurred. In the case of one little girl, the discharge from the ear ceased after several injections. The otologist in charge of the case reported that, to judge from an examination of the ear he considered the inflammatory process at an end. However, the little girl developed a meningitis a few months later and died. At the autopsy the case proved to be purulent meningitis due to extension from necrotic bone in the affected ear. The auditory canal was clean, and there was little evidence of inflammation in the lining of the middle ear. A few of the cases are cited below.

One case, suppurative otitis media, right ear, for several years. Left ear, for two weeks; furunculosis, left external auditory canal. Vaccine made from the discharge from each ear and the two mixed. Two injections, with interval of one week. Complete recovery in both ears, and the ears remain well 6 months later.

Another case, suppurative otitis media, left ear, for two weeks. Discharge stopped four days after first injection and ear remains well six months later.

A third case, with a left otitis media that had recurred several times at intervals of some months, received a single injection of a personal vaccine and the discharge ceased the next day. The patient left the city, and I understood that the discharge began again some time later. As the first dose is always a small one, I would not expect recovery in a long standing case from a single injection.

A fourth case, of suppurative otitis media with furunculosis of the external auditory canal, cleared up slowly under a personal vaccine and finally the discharge stopped and the patient expressed herself as feeling much better in general health than she had been previously. However, the purulent discharge from the ear has since recurred.

I have had an opportunity to treat four cases of pyorrhœa alveolaris with personal vaccine. Two cleared up entirely after a few injections, while the other two showed no apparent improvement after long series of injections.

A few practical points on dosage, vaccines, and injections seem worthy

of mention. In the more acute conditions it is not advisable or possible to give as large doses of vaccine as when the condition has become more chronic. Thus, a chronic gonorrhoeal arthritis will stand without any reaction a dose of gonococcus vaccine that will cause fever and marked discomfort in a case of epididymitis or acute urethritis. It is advisable in acute conditions to give small doses at shorter intervals and thus assist the body cells in walling off a process that threatens to become general; for instance, small injections of a personal vaccine in a case of cellulitis will localize the condition so that we have an abscess to open instead of a case of septicæmia to treat.

It is important to inject near the seat of the infection and in such a position that the lymph flows from the site of injection through the area of infection. A case of gonorrhoeal arthritis of the right knee had received two injections of gonococcus vaccine in the buttock without any apparent effect on the lesion. The patient was then given an injection of gonococcus vaccine into the right leg about six inches below the knee. On the next day the relief from the pain was marked, progress toward recovery was rapid, and the patient walked out of the hospital in two weeks after the injection.

It sometimes happens that a case does not respond to injection with a personal vaccine, or else the response is satisfactory for the first injection or two and then the patient remains stationary or gets worse. In such instances a new vaccine should be prepared from fresh cultures, and this vaccine will often give satisfactory results.

It is important to continue the use of other accepted methods of treatment in a case that is receiving bacterial inoculations, and the production of local hyperæmia is always to be combined with bacterial inoculation wherever it is possible to do so.

In conclusion, I would say that bacterial vaccination is to be considered as an important method of treatment for certain diseases; in fact, there are a few conditions in which the results are far better than from other methods of treatment that we now have, but it is not in any sense a "cure all." In some conditions it does no good, in others it is of relatively slight value, while even in the diseases where the results are the most satisfactory there are individual instances where there is little or no improvement. Possibly, with increasing knowledge and experience we may learn the reason for some of our failures, and with this may come the ability to use the method with even better results than we are obtaining at present.

DISCUSSION.

DISCUSSION ON THE PAPER, "AN EXPERIMENT WITH ORANGE-RED UNDERWEAR," BY DR. J. M. PHALEN.

Dr. Aldo Castellani, professor of tropical medicine and lecturer on dermatology, Ceylon Medical College, Colombo, delegate from the Government of Ceylon.—Doctor Chalmers and myself have made some experimental researches on the subject in Ceylon. We have compared the results obtained by exposing some rabbits directly to the sun-rays and by protecting others by placing white, red, etc., cloths on the cages. Those protected by red cloth, or by cloth, white outside and red inside, survived the longest. We also had good result by using Doctor Sanborn's "solaro" cloth. However, I frankly admit that experiments on man as made by Doctor Phalen are of more practical importance than experiments on rabbits as carried out by Doctor Chalmers and myself.

Dr. W. P. Chamberlain, major, Medical Corps, U. S. Army, president of the United States Army Board for the Study of Tropical Diseases as They Occur in the Philippine Islands.—These experiments do not show that khaki cloth is as protective as orange-red against the chemical rays that affect the photographic plate.

Dr. Victor G. Heiser, Director of Health for the Philippine Islands, professor of hygiene, Philippine Medical School, Manila, P. I.—The data given in this paper are indeed interesting. As I understand it, these experiments were carried out with soldiers who wore khaki outer clothing and controls wearing the same clothing. Furthermore, if I understand correctly, the author states that he has observed individuals who have been in the Tropics for six years or more and who wore khaki clothing continuously, and that in such persons the protected skin showed no pigmentation, from which he inferred that the tropical light was effectively excluded by khaki. If this is the cause, it would seem that in order to draw correct deductions, it would have been better to make these experiments with soldiers who wore white outer clothing and orange-red underwear and with controls who wore white outer clothing and white underwear, or that one regiment should have been dressed entirely in white and compared with a regiment that was dressed in khaki.

REVIEWS.

Naval Hygiene. By James Duncan Gatewood, M. D., instructor in naval hygiene, U. S. Navy, Medical School, Washington, medical inspector, U. S. Navy. Prepared by the direction of the Bureau of Medicine and Surgery, and published by permission of the Navy Department. Cloth. Pp. xiv-779. Eight colored plates and 105 other illustrations. Price \$6 net. Philadelphia: P. Blakiston's Son & Co., 1910.

This book, which specializes upon marine hygiene, is the first that has been published in English in over twenty years. The discussion of the relative prevalence of diseases as they occur in the United States Navy is well arranged and many deductions may be made therefrom.

The method of ascertaining the full damage done to the service in any one year by a single disease is entirely new and affords an excellent opportunity for testing the healthfulness of the service. However, the value of the book is detracted from by many statements which are not properly supported by evidence: For instance, it is stated on page 59 that continued residence in the Tropics tends to physical degeneration, and that experience has shown that the Navy should avoid the Tropics during the objectionable months. No evidence whatever is given in support of this statement and as such it can be regarded only as the opinion of one individual. On page 132, no mention is made of disinfection as a measure against smallpox, whereas, in other parts of the book, disinfection for other diseases is described in great detail.

It is believed that subsequent editions of this work could be much improved by eliminating some of the purely elementary matter and also by inserting additional headlines. The text sometimes goes on unbroken for 50 pages and the index is not sufficiently comprehensive to overcome this defect. However, the book on the whole is a most valuable one and should be on the shelves of all students of naval hygiene.

Doctor Gatewood is to be congratulated upon having produced so excellent a work in a field in which the literature is so meager.

V. G. H.

A Manual of Toxicology. By Albert H. Brundage, Professor of Toxicology and Physiology in the Departments of Medicine, Marquette University. 7. ed., revised and profusely illustrated. Cloth. Pp. x+428. Price \$2.50 net. New York: The Harrison Co., and London: Baillière, Tindall & Cox, 1910.

Laboratory Text-Book of Embryology. By Charles Sedgwick Minot. 2. ed. revised. Pp. 402, 262 illustrations, chiefly original. Cloth. Price \$3.50 net. Philadelphia: P. Blakiston's Son & Co., 1910.

As the name indicates, this book is not a laboratory guide for embryology, but a text-book for the laboratory study of embryology. Its scope is somewhat extensive and the material contained in it is for the most part essentially of a text-book nature. It is divided into eight chapters as follows: Chapter I, "General considerations," devotes thirty-one pages to an introduction to embryology and its various fundamental aspects. This chapter sets forth considerations which are to be borne in mind in studying any phase of embryonic development and which no doubt are meant to give the student a broader and more scientific point of view before taking up the detailed study of embryology. Chapter II, "The early development of mammals," after taking up first the histology of the male and female sex cells and the maturation of the ovum, at once enters into the study of the embryonic development of mammals, the most difficult group we have in embryology. Chapter III, "The human embryo," deals with the different stages of development of the human embryo. Several good illustrations are given. Chapter IV takes up the "Study of the segmentation of the ovum and of the blastodermic vesicles in mammals." Chapter V devotes 45 pages to the "Special embryology of the chick and its relation to development in the mammals." Chapter VI, "Study of pig embryo" covers 120 pages and from the standpoint of strict embryology is perhaps the most valuable section of the book. The embryonic development of the pig is portrayed in a comprehensive and lucid manner and the many excellent drawings and reconstructions in this chapter make it easily understood, and give an excellent conception of the extent of development of the various organs and tissues and their relations to one another in the different stages of the embryonic history of this animal. Many of these illustrations are so clear, that they alone, with their explanatory descriptions, would give a pretty fair idea of the embryology of the pig. Chapter VII, "Study of the uterus and the fetal appendages of man," embraces a study of the histology of the uterus, menstruation, the pregnant uterus, decidua, chorion, amnion, placenta, etc. Several stages of some of these are taken up and illustrated. Chapter VIII, "Methods," gives several valuable suggestions in regard to preparing and measuring embryos and the preparation of sections of embryos.

The subject-matter is thoroughly reliable, excellent, and well correlated. However, the arrangement probably deserves severe criticism. While being an improvement over the former edition in that the study of the embryo begins at the early stages and leads up to the later, instead of the reverse, it still by no means conforms to the arrangement of subject-matter, which, by embryologists, usually is considered chronological.

The simpler forms, including the chick or the frog, are generally taken up first as they are supposed better to help us to understand the more complex forms, including man.

In reading the book through, the impression was gained that, with the above limitation, it is well suited for students of embryology who have had a well-grounded preliminary training or an introductory course in embryology, in institutions which possess a good embryological museum, a good technician, and a graduate staff of instructors. Elsewhere it well deserves a place in the library as a book of reference, but not as a laboratory text of embryology.

ELBERT CLARKE.

Medical Education in the United States and Canada. A Report to the Carnegie Foundation for the Advancement of Teaching. Bulletin No. 4. By Abraham Flexner. With an introduction by Henry S. Pritchett, President of the Foundation. Paper. Pp. xvii+316. 576 Fifth Avenue, New York, 1910.

No publication of the year 1910 has occasioned so much interested comment, and none will be the cause of so much general good to the community as this report to the Carnegie Foundation on Medical Education in the United States and Canada. If a Noble prize were to be awarded for the most stimulative and the most courageous publication of the year, Doctor Flexner should have first mention. It has required no minor quality of courage for the president of the Carnegie Institution and the author of the report to attack so boldly the evils of our medical educational system. Educational authorities are no less firmly entrenched behind the barriers of their self-esteem and the customs of the past than are the "malefactors of great wealth," and the principle upon which rest the people's campaign against unjust corporations and this newly organized war upon unfit educational institutions is the same, namely, that all institutions which fail to serve the people well and with undivided interest must make way for such as shall.

In regard to medical education, we are beginning to realize the fact that those who pay the bill for the education of a physician are not those who furnished the modest amounts necessary to meet the registrar's fees, but the members of the community among whom the physician lives after receiving his license to practice the art of healing; and a costly education it proves for many a community which is plagued by an illy equipped, ignorant, unskillful doctor instead of being benefited by the skillful physician it has the right to expect. Reading the pages of this report intensifies the horror most of us have of being obliged to call in a doctor of whom we know nothing except that he has the degree of M. D.

"The day has gone by when any university can retain the respect of educated men, or where it can fulfill its duty to education, by retaining a

low-grade professional school for the sake of its own institutional completeness."¹

For the purposes of the report, every medical school in the United States and Canada, of every sect, has been visited by the author. Doctor Flexner is not the first carefully to inspect the work and equipment of these schools, so every statement of his has been checked and corroborated. The essential part of the report is that which includes his statements of the equipment of each school. The States of the Union are taken up in alphabetical order. In each case the population of the State and the ratio of physicians to population are given. The report on each institution considers the entrance requirements, attendance, teaching staff, resources available for maintenance, laboratory and clinical facilities. These individual reports are succinct, accurate, and just. Where schools are honestly doing their best, although under a mistaken impression of their duty to the public, the author does not begrudge proper recognition of this spirit. For example, at the Woman's Medical College of Baltimore, with an attendance of 22, and resources from fees amounting to \$2,000 a year, "small laboratories, scrupulously well kept, show a desire to do the best possible with meager resources." But, unfortunately, the majority of the medical schools of the United States are found to be doing anything but their best, and the conditions of these schools are described without mercy. Of one medical college the report says: "There is no outfit worth speaking of in any department; the building is wretchedly dirty, especially the room said to be used for anatomy. There is nothing to indicate recent dissecting * * *. There is no organized dispensary." It is a difficult, though interesting, task to discover which is the worst school among the many that are unfit to exist.

Of another college the report says:² "The school building is wretchedly dirty. Its so-called laboratories are of the worst existing type; one neglected and filthy room is set aside for bacteriology, pathology, and histology; a few dirty test-tubes stand around in pans and old cigar boxes. The chemical room is perhaps equal to the teaching of elementary chemistry. The dissecting room exhausts its teaching facilities. There is no museum or library and no teaching accessories of any sort whatsoever."

Of still another,³ Doctor Flexner reports: Attendance 172; teaching staff, 30 professors and 15 lecturers; fees amounting to \$10,000 per annum are its sole resources; a reduction of 20 per cent is made to students who pay in advance for the entire four years; laboratory facilities "are wretched; ill-lighted, dirty, and poorly equipped so-called laboratories are provided for anatomy, pathology, etc. The clinical facilities are dubious. The catalogue attempts to convey the idea that the school has

¹ Introduction to the Report, page xi.

² Page 237.

³ Page 242.

the same opportunities as Harvard and Tufts; as a matter of fact no member of the faculty * * * has a staff appointment in the city hospital, and teaching there is utterly impossible otherwise. * * * A limited attendance is required at a miserable dispensary, more than an hour's journey from the college building."

There is no need to make a list of all the schools the resources of which are wholly from fees, and mostly diverted to stockholders pockets, or the laboratories of which are nil, or "hopelessly meager," "absurdly inadequate," "make-believe," "dirty," or "filthy," or whose clinical facilities are utterly inadequate. Suffice it to say that the good schools are very much in the minority, and yet there are a sufficient number of them to supply the country with all the doctors of medicine needed. The pity of it all is that almost every student at every low-grade medical school is earnestly desirous of a good education, is paying for it, and believes he is getting it. It is not until he has graduated that he learns that his education has been defective. How defective is vividly illustrated by the class of "post-graduate" schools which have sprung up in order to catch these very men under the guise of helping them to overcome their deficiencies. For example, notice the report on one post-graduate school of medicine. "A post-graduate institution organized as a stock company. Offers special courses to graduate physicians. Attendance: Perhaps 30 at any given time; a total of 350 in the course of a year. Teaching staff: 92, 30 being professors, 62 of other grade. Resources available for maintenance: Fees. Laboratory facilities: A small clinical laboratory, the instruction in technique being given by a first-year student in one of the night schools; in the absence of the instructor he also conducts classes. Clinical facilities: The main reliance is the hospital of the institution, of 80 beds, two-thirds of them surgical." Apparently the average post graduate college has little real help to offer the physician.

The report does not attempt to give the histories of any institution, only what they are now. There is a general historical account of medical education in the United States, followed by a thorough discussion of the laboratory branches and the relations of the medical school to the hospital and dispensary. A chapter is devoted to the financial aspects of medical education, and finally the all-important subject of reconstruction is discussed. The plan proposed is admittedly theoretical, yet it is specific in that the favorable locations of the medical colleges of the future are pointed out. As long as medical schools are left to organize and reorganize as they please, to establish their own entrance and graduation standards, and to determine freely the amount of practical clinical work necessary, so long will many doctors seize the opportunity for advertisement and reputation which connection with the staff of any sort of a school affords and so long will poor schools remain with us. The ignorant student who will be attracted to these schools in spite of the presence of

the really good schools, will always exist. But the establishment of standards of entrance and equipment to which all schools must conform will very soon eliminate the majority of American medical schools, and the probabilities are that the ideal plan of Doctor Flexner will very nearly be realized in a comparatively few years. The plea that young men must not be compelled to spend so many years in study that they will be well along in the twenties before commencing the practice of medicine is losing its force before the realization that a few years more of practice for the physician is a small matter compared with the welfare of the community.

Aside from its direct bearing on medical education, this report will have a far more widespread and important effect upon education in general. Every experienced educator knows that the "colleges" of the United States stand in more need of regulation and standardization than even the professional schools. The name of college covers a multitude of educational sins, and even many serious sins resulting from greed, envy, and cupidity, not to mention ignorance. We hope that the time is not far distant when a plain-spoken, brutally truthful account will be given of every college in the United States, which shall force each into its own proper position in the educational system. But as long as the reports on education consist of statistical tables of the faculties, equipment, and financial resources of the colleges (as the colleges themselves report them for publication) and perfectly harmless essays upon the systems of education in Germany, France, and England, there exists no basis for the establishment of college standards. The most efficient educational work to-day is being done by certain of the State universities of the Middle West in their supervision of the high schools.

LAWRENCE E. GRIFFIN.

An International System of Ophthalmic Practice. Edited by Walter L. Pyle, A. M., M. D. *Therapeutics*, by A. Darrier, M. D. Translated by Sydney Stephenson, M. B. Cloth. Pp. xxiv+444. Price \$4.00 net. Philadelphia: P. Blakiston's Son & Co., 1910.

The relative value of a modern work on therapeutics can be discussed from many viewpoints. The editor of "An International System of Ophthalmic Practice," states in his preface that the purpose of this work is to present up-to-date methods of ophthalmic practice.

A recent method of cataract extraction as used by Smith, in India, is not mentioned. Favorable results with argyrol in maternity hospitals as a Credé substitute are stated, but no mention is made of the fact that several practitioners have abandoned its use as unreliable. Whether right or wrong, a one-sided statement is open to criticism.

The subject-matter is arranged under the headings "General therapeutics" and "Special therapeutics." Under "General therapeutics,"

the reviewer is impressed with the author's faith in the value of "para-specific therapy," "guaiacol," "subconjunctival injections," and the ease of obtaining accurate laboratory confirmation in the diagnosis of eye affections. A too general use of many remedies as specifics, when unsupported by reliable statistical data, has in the past resulted in losing sight of their true value. It has taken years for "tuberculin" to recover from such a doubt. Further, it is difficult to believe that one or two attempts are sufficient to make laboratory diagnoses easy of accomplishment. An accurate Wasserman's reaction is never a simple matter. The use of such an expression as "arthritis," meaning absolutely nothing, is objectionable.

The second part of the book, under the heading of special therapeutics, gives in detail pathologic conditions of the eye and its adnexa. The affections are grouped into separate chapters, beginning with diseases of the orbit, following through the various anatomical structures to the retina. There is little new in pathology, diagnosis or treatment, but special stress is laid on the great value of injections of mercury, intravenous or subconjunctival, paraspecific therapy, organic silver salts, and dionin.

The different nationalities engaged in presenting this book are in keeping with the international character of the system. The brief footnotes of the editor make the reader regret that he has not made more liberal use of his control. Such notes, stating that "correcting lenses in blepharitis marginalis is a *sine quo non*," and "the stimulation of compensatory accommodative power by any means is likely to be followed by all the baneful local and reflex symptoms of ametropic eyestrain," are excellent. Similar footnotes, condemning strongly such drugs as "atoxyl" and such a reaction as that of "Calmette," should have been made. Had chapters 7, 8, 9, and 10 been condensed into one, much that is of little value would have been eliminated.

As a reference book, "An International System of Ophthalmic Practice" can hardly be recommended, because of its looseness in grouping, and absence of a bibliography, but it shows advanced thought and gives an insight into the future lines of progress in ophthalmic practice.

T. C. LYSTER.

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